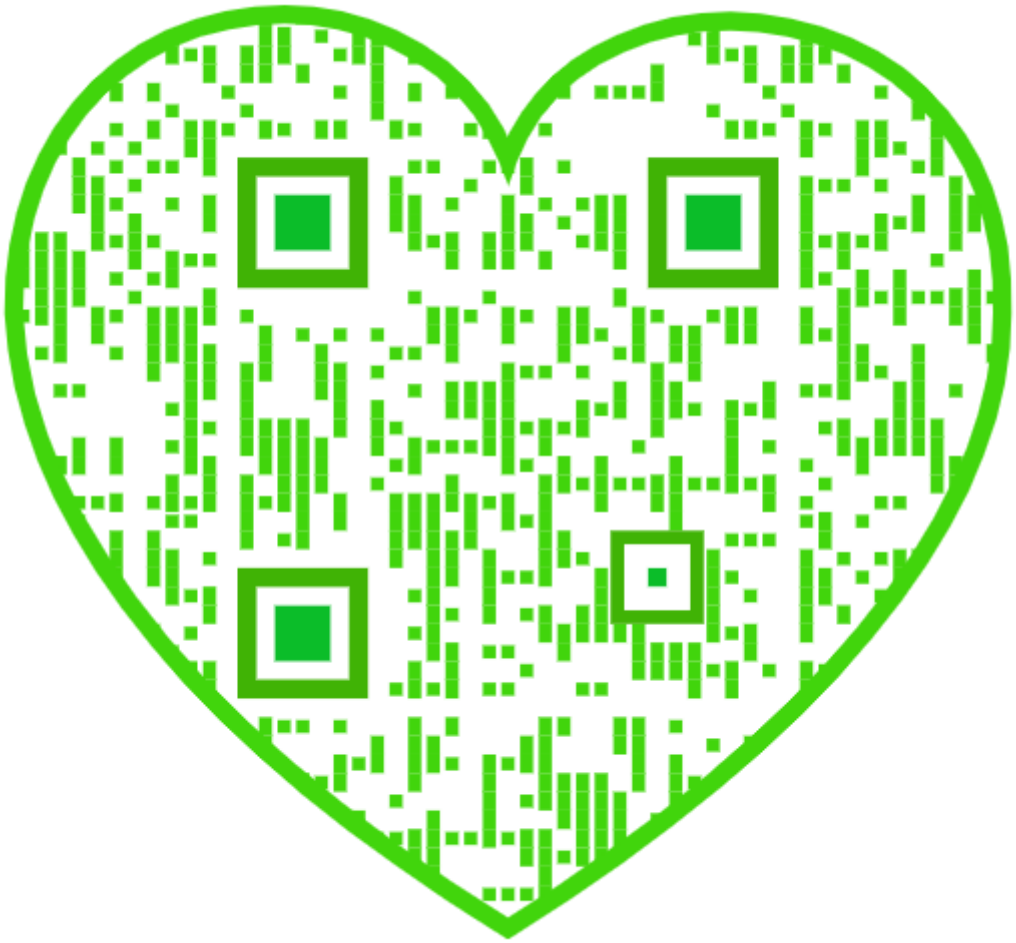

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FEVERS:

THEIR

DIAGNOSIS, PATHOLOGY,

AND

TREATMENT.

PREPARED AND EDITED, WITH LARGE ADDITIONS,

FROM THE ESSAYS ON FEVER IN

TWEEDIE'S LIBRARY OF PRACTICAL MEDICINE,

BY

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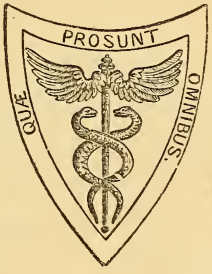

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PREFACE

OF THE AMERICAN EDITOR.

The want of a distinct treatise on Fevers, embodying the received doctrines of their pathology and treatment, has been long felt and generally acknowledged. To supply this deficiency in medical literature is the object of the present volume. It has been prepared from the Essays on Fever contributed by Drs. Christison,[1] Shapter,[2] Burrows,[3] Gregory[4] and Locock[5] to Dr. Tweedie's "Library of Practical Medicine," and will be found to embrace the whole class of Idiopathic Fevers—Continued, Periodical, Eruptive and Puerperal. The additions of the Editor—amounting to about one-half of the volume—have been chiefly made with reference to the fevers of this country. It has been his aim to render the work as complete as possible, and to adapt it particularly to the necessities of the American practitioner.

The additional matter is distinguished by brackets, thus [ ].

M. C.

230 Spruce Street,
1st May, 1846.

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DISSERTATIONS ON FEVERS.

CHAPTER I.

GENERAL DOCTRINES OF FEVER.

I. DEFINITION.

[Syn. *Pyrexia, Pyrexis. Febris. Fièvre,* Fr. *Fieber,* Germ. *Febbre,* Ital.]

Fever (*febris* from *fervere,* to glow, to be hot*) is so named from one of its most prominent symptoms—a sense of increased heat.

The term has a double signification, both in nosographical and in familiar professional language. For sometimes it is applied, especially in the plural number, to all febrile diseases, including primary fevers, eruptive fevers, and acute local inflammations. And at other times it is used, particularly as a singular noun, to denote primary fevers only, or fevers proper; while, for embracing the whole class of febrile diseases, the more generic term Pyrexiæ is commonly employed; which, however, according to its original meaning, (from πυρέσσω, *febricito,* derived from πῦρ, *ignis*†,) does not essentially differ from the more specific term, fever.

It is in the restricted signification, implying those febrile diseases where the pyrexia is simple, or not combined, at least necessarily, either with eruptions of the skin, or with local inflammation, that the subject of fever will be here in the first place considered.

Fever has been variously defined. Probably no better definition can be found than the following, a modification of that sanctioned by Cullen:—*After a preliminary stage of languor,*

[* *Fever, febris,* from *fervere, to boil;* or from *fervor, effervescence,* because it was supposed that the humors in fevers were in a state of motion similar to that of liquids in ebullition. Others derive the word from *februare, to purge, to purify,* because fever was regarded by many physicians as a salutary operation of nature.]

[† *Pyrexia,* used by the Greeks to designate fever, is derived from πῦρ, πυρετός, *fire,* expressive of the heat; which is one of the predominant characters of the febrile state.]

weakness and defective appetite—acceleration of the pulse, increased heat, great debility of the limbs, and disturbance of most of the functions, without primary local disease. It is a singular instance, however, of the extreme difficulty of arriving at correct nosographical definitions, that scarcely any one of the characters here assigned is absolutely invariable; nor is it likely that any other definition will be found, which is not subject to the same defect.

[A definition is wholly inadequate to convey a suitable idea of the morbid phenomena, which, in the aggregate, constitute Idiopathic Fever; as it is impossible for it to embrace all the forms and varieties they may assume. A description is much more likely to effect it. To attempt this, the most constant, as well as prominent characters, should be selected, and separated from the subordinate or contingent phenomena. The essential symptoms being thus ascertained, the physician is enabled to detect the disease, whatever shape it may assume; or to distinguish it from any affection for which it might be mistaken. Few of the phenomena are constant, or are present in all the stages of the disease; and the characteristic features vary much in degree, and in the manner of association. Dr. Copland thus describes Idiopathic Fever:—"*It commences with debility and lassitude, which are followed by chills or rigors; it is generally composed of several invasions or exacerbations; it implicates the whole of the vital endowments and faculties, the fluids, and the entire organization; it is acute and dangerous in its course, with lesion of the circulation, with alteration of the animal heat and of the secretions, and with diminution of vital power; and it is versatile as to its symptoms and type, with efforts at sudden changes or crises.*"—(*Dict. Pract. Med.*, Am. Ed., by Dr. Lee, p. 1041.)

Debility and lassitude (*malaise, fatigue, courbature*), are among the earliest and most constant symptoms. They are obviously the effect of some debilitating or depressing influence acting on the nervous system. There is an absolute aversion to all mental and corporeal exertion; together with general unpleasant and peculiar sensations—as præcordial anxiety; restlessness; creeping chills along the spine; horripilations, &c.; alternating with flushings of heat, with hurried, or suspirous breathing.

Quickened circulation and increased animal temperature have been regarded, by most writers, as the most constant as well as salient phenomena of fever, and probably with justice. Though in some fevers the pulse may be, at times, slower than in health, they are to be regarded as transient, and rare exceptions, easily explicable by reference to existing disorders of innervation, and by no means diminishing the general value of increased rapidity of the pulse in the diagnosis of fever. The temperature

of the body is variously altered in the different stages of fever. There may be increased heat from the commencement; though generally the feeling of cold is experienced at the period of invasion; which, however, may be nothing more than a morbid sensation of the patient—the hand of the physician, applied to the surface, at the moment of complaint, detecting an increase instead of diminution of heat; and the mercury, in a thermometer placed in the axilla, rises several degrees. The elevation of temperature is variable. It is felt by the patient; and is detected by the physician placing his hand upon the body. The thermometer in the axilla, indicates, too, an increased temperature of from 1° to 5°. The sensation of heat felt by the patient is not always in proportion to the actual rise of temperature. It is not, however, a mere increase or diminution of heat which constitutes the whole of this phenomenon; but a peculiar, a morbid alteration of temperature, hardly admitting of description. There is more or less derangement in the secreting and exhaling functions, indicated by the anorexia, thirst, state of the secretions and excretions, and the hemorrhages which occur. The *paroxysmal* character of fever is evident in all its forms, whether we regard the regular, well-marked paroxysms of intermittent and remittent, or the perpetual exacerbations of continued fever. It will be shown hereafter, conclusively, it is hoped, that fever involves all the functions and all the constituents of the body. *Critical changes* or *crises* are of constant occurrence in idiopathic fever, giving the idea of a depuratory effort of nature—favourable changes frequently supervening. The character of fever is *mutable*, presenting ever-varying forms and varieties. "Fever," says Dr. Southwood Smith, "is a genus consisting of several species, and each species presents many varieties. The external characters of these varieties and the internal states upon which they depend, are so opposite, that no two diseases in any two parts of the catalogue of nosology present a more diversified appearance, or require a more varied treatment, than may be the case with two different types of fever. The fever of one country is not the same as the fever of any other country; in the same country, the fever of one season is not the same as the fever of any other season; and even the fever of the same season is not the same in any two individuals. Many of the circumstances which constitute these varieties in the fevers of different seasons and of individual persons, are slight and trivial; but some of them are of the greatest possible importance, and those diversities, especially, which distinguish the fevers of different climates, are intimately connected with the causes, whatever they be, which render the disease mild or severe, and, consequently, comparatively innoxious or fearfully mortal.

"Something there is, however, which, amidst this astonishing

diversity, preserves the identity of the disease so completely and so obviously, that there never has existed any dispute about that identity, under any aspect which it has hitherto been observed to assume; so that all physicians, without exception, unhesitatingly accord the name of fever to the mildest form of the common fever of this country, to the yellow fever of the West Indies, and to the plague of Constantinople and of Egypt."—(*Treatise, &c.*, p. 37.)

Dr. Smith goes on to remark, that if three persons, each exhibiting an exquisite specimen of one of the several forms of the disease, were brought into the same ward of an hospital, the external aspect exhibited by each would be so different, that an ordinary observer would fail in discovering any common property, yet the physician would pronounce them at once to suffer from fever. To establish this identity in the professional eye, under such a diversity of aspect, there must be particular phenomena, common to all the varieties and combinations of the disease. To ascertain these essential phenomena has been the object of all writers on the subject from Hippocrates to the present time. But little success has, however, attended these efforts, though the acutest minds in the science have been applied to the analysis. The exposition of Dr. Southwood Smith on this subject—in which some of the errors of those who have pursued this path of inquiry, are pointed out, and the proper mode of investigation indicated—is so able and lucid, that we shall offer no apology for transferring it to our pages.

"This total failure of men, all of them of unquestionable acuteness, and some of them of splendid genius, in their attempts to discover the common phenomena of fever, affords a strong presumption that they have not pursued their object in the right path. Without doubt, before it is possible to succeed in any scientific investigation, it is necessary to form a distinct conception of the object of inquiry. Fever is not an entity, not a being possessing a peculiar nature; and the object of investigating it, is not to discover in what such nature consists, or what it is that constitutes its essence; but fever is a series of events, and the object of inquiry is to discover what the events are; what the events are that invariably concur in the series; and in what order they constantly succeed each other. When we have discovered this, we have ascertained all that we can ever know of what is termed the nature of fever, as it is this, and only this, that we can ever know of any object or process. Every natural object consists either of one single substance, or of several substances united; and our knowledge of that object is complete when we have ascertained what that single substance is, or what all the separate substances are that combine to form it. Every natural process consists of a number of events, and our knowledge of that process is complete when we have ascertained the events themselves, the order of

their succession, and the events to which they give occasion. We can make no real progress in knowledge unless we keep steadily in view the kind of information which it is possible to acquire, and which it is to our purpose to seek; and dispossess our minds of the phantoms which have so long enthralled and abused them.

In relation to our present subject, then, the first object of inquiry is, what are the events which invariably concur in fever?

Where shall we look for the events? Not in the symptoms. Symptoms are not events; they are only indications of events; symptoms depend upon states of organs; they are the external and visible signs of internal, and, for the most part, as long as life continues, invisible conditions. It is then to the state of the organs that we must look for the events of which we are in search.

Are there any states of any organs that always exist in fever? Are the states constant? Are the organs affected constant; and can both be ascertained? If this can be truly answered in the affirmative; if it can be proved that there are certain conditions of certain organs which invariably exist in fever, in every type, in every degree, in every stage of it, we shall have arrived at a satisfactory conclusion relative to the first part of our inquiry.

The evidence is as complete as observation during life and inspection after death can make it, that a morbid change does take place in a certain number of organs in every case of fever, from the most trivial intermittent to the most alarming continued fever, from the mildest plague to the most malignant typhus; that at the two extremes of this scale, and at all the intermediate gradations of it, there are certain organs which are always affected, and that the affection in all is similar.

The identity of the organs is inferred from the indications they give of disordered function during life; the identity of the affection is inferred from the similarity of morbid appearances which they exhibit on examination after death.

The organs affected are those which constitute the nervous system; those which constitute the circulating system, and those which constitute the systems of secretion and excretion. The spinal cord and the brain; the heart and the arteries, especially their capillary extremities; the secreting and the excreting organs, which, in fact, are composed, essentially, of the capillary extremities of the arteries; the secreting and the excreting extremities of these arteries, especially as they terminate in the external skin, and in the mucous membranes which form the internal skin, this is the chain of diseased organs, derangement in the nervous and sensorial functions; derangement in the circulating function; derangement in the secretory and excretory functions, this is the circle of morbid actions.

There never was a case of fever in which all these organs and

affections were not more or less in a morbid state; there never was a concurrence of this morbid state, in this complete circle of organs, without fever. The events which *invariably* concur in fever, then, are a certain deviation from the healthy state in the nervous and the sensorial functions; a certain deviation from the healthy state in the circulating function; a certain deviation from the healthy state in the functions of secretion and excretion. A deviation from the healthy state in one circle of actions will not present the phenomena of fever; a deviation from the healthy state in two circles of action will not present the phenomena of fever; there must be a deviation in the three circles before fever can exist. Such, then, are the common phenomena of fever.

For obvious reasons the detail of the proof that these several events really and invariably take place, must be postponed until the phenomena themselves have been stated, or what is termed the history of the disease has been given.

But it is not the invariable concurrence of a particular number of events that is alone sufficient to constitute fever; to this must be added invariableness of concurrence in a particular order. As will be shown in the proper place, there is complete and irresistible evidence that these events do occur in one invariable order. Derangement in the functions of secretion and excretion never comes first in the series; derangement in the nervous and sensorial functions never comes last in the series; derangement in the function of the circulation never comes either the first or the last in the series, but is always the second in succession.

The order of events then is, first, derangement in the nervous and sensorial functions; this is the invariable antecedent: secondly, derangement in the circulating function; this is the invariable sequent; and thirdly, derangement in the secreting and excreting functions; this is the last result in the succession of morbid changes.

Supposing the matter of fact to be as is here stated, and the proof that it is so will be adduced hereafter, it is clear that we are in possession of the true characters of fever. We know the events; we know the order in which they occur; we know, therefore, what it is that constitutes the disease, and we know, consequently, what it is by which it is distinguished from every other malady. No other disease exhibits the same train of phenomena in the same order of succession. In inflammation some of the phenomena are the same; but the order in which they concur is not the same; and this affords a clear and universally applicable mark of distinction between fever and inflammation. In inflammation there is similar derangement in the secreting and excreting functions; there is also sometimes similar derangement in the circulating function; but the derangement in the nervous and sensorial functions is seldom, if ever, similar; the derangement

that does take place in these latter functions, while it is apparently different in kind, is certainly and invariably different in the order of its occurrence. In pneumonia, in enteritis, in hepatitis, the spinal cord and the brain are *never* the organs in which the *first* indications of disease appear; the earliest indications of disease that can be discovered have their seat in the affected organ itself; it is only after the disease has made some progress that other organs and functions are involved; and, apparently, the last to be involved, and certainly the least to suffer, is the nervous system.

We can now, then, answer the questions so often asked—are fever and inflammation the same? and if not the same, in what do they differ? Fever and inflammation are not the same, because the term fever is appropriated to the designation of a certain number of events which occur in a certain series; the term inflammation, on the other hand, expresses another series of events, each event composing this train, succeeding each other in a different order; and the difference between the two series of events is precisely this difference in their individual phenomena, and in their order of succession. What the physical and the physiological condition of the organs is, as contrasted with their condition in the state of health, has not yet been made out with regard either to fever or to inflammation; in the present state of our knowledge, therefore, we can neither affirm nor deny anything respecting either the identity or the difference of that physical and physiological condition of the organs in these two classes of disease. What inflammation is beyond the series of events we are able to observe, we do not know; what fever is beyond the series of events we are able to observe, we do not know; we compare the events and we see that they differ; and since the use of names is to mark and to express differences, it is right to distinguish these different events by different terms. But though in the present state of our knowledge, we are not justified in considering fever and inflammation to be the same, yet the close, perhaps the constant connection between them, is a fact of the utmost importance to be known, and requires to be incessantly before the view of the practitioner. And of this we shall have but too abundant evidence in the sequel.

Supposing the proofs hereafter to be adduced to be conclusive, that the events in fever and their order really are what has now been stated, how clearly and beautifully does this view of the disease enable us to recognize one and the same malady through all the modifications it undergoes, and, therefore, through the countless aspects it assumes. Out of the system of organs that are always affected in fever, some may be more and some may be less diseased; and it is easy to see how, from this diversity alone, the utmost variety may arise in the external characters of the disease. Thus, at one time, the spinal cord and the brain may

be intensely affected; consequently the patient may be seized with violent pains in the limbs; with ferocious headache; with early delirium, which may rapidly increase to such a degree of violence as to require restraint; or, on the contrary, all the muscles of voluntary motion may be seized instantaneously with such a loss of energy that they may truly be said to be paralyzed; at the same time the sensorial faculties may be overwhelmed almost as completely as they are in apoplexy: thus may be formed one type of fever: and such a concourse of symptoms is actually found to exist: it ushers in the plague when it first stalks into a devoted city to sweep away its thousands and its tens of thousands.

At another time the disease may seize with peculiar violence upon the organs of secretion, and especially upon those which belong to the digestive apparatus: hence the liver may suddenly pour forth an immense flow of bile, so vitiated in quality as to irritate and inflame whatever it touches, and so abundant in quantity as rapidly to diffuse itself over every part of the body, and to tinge almost every tissue and every fluid: at the same time the stomach and intestines may be involved in such acute disease that the powers of life may be exhausted in a few hours by incessant vomiting and unconquerable purging: thus may be formed another type of fever, and such a concourse of symptoms actually occurs in the yellow fever of the West Indies.

Now we may witness a severe though a less violent affection of the spinal cord and the brain than occurs in plague. There may be present great pain in the back and limbs; intense headache; early and violent delirium; a burning skin; a quick and strong pulse; urgent thirst, and constipated bowels; or, on the contrary, there may be, not pain of the head, but giddiness; not delirium, but stupor; not a burning hot, but a moderately warm or cool skin; not a frequent and strong, but a frequent and feeble pulse. In either case we have a fair specimen of the common fever of our own country, the first forming the variety which may be termed acute, the second subacute cerebral.

Now again we may witness a concurrence of symptoms very similar to the latter in the commencement of the attack, only that there is from the beginning greater prostration of strength; and a rapid increase in the derangement of the nervous and sensorial functions: together with a brown and dry tongue; a tender abdomen, and dark and offensive stools; thus may be formed another type of fever to which is commonly assigned the name of typhus.

In each of these cases the most urgent symptoms have their seat only in one set of the organs that compose the circle which we have said to be involved; but in every case all the other organs included in that circle are as really, though not as intensely diseased. When the spinal cord and the brain are so violently affected that the patient appears to be struck with paralysis or

apoplexy, the attention is not strongly drawn to the state of the mucous membrane of the digestive apparatus; to the nature of the secretions and excretions of which it is the source; to the temperature of the system, or to the condition of the circulation; because the affection of the nervous system being overwhelming, and all the other affections being comparatively trifling, it is natural that the former should, in a manner, absorb the mind of the observer; yet, if the skin, the pulse, the tongue, the evacuations are examined, all will be found to be in a morbid state, and that morbid state will bear a certain proportion to the affection of the nervous system.

In like manner when the organs of the digestive apparatus form the stronghold of the disease, the morbid condition of the spinal cord and brain, and the altered action of the heart and arteries, may attract less notice; but that morbid condition will be not the less real, and will contribute its portion of disease to the general derangement of the system, not the less certainly because the indications of its existence may be less obtrusive.

And in the milder forms which the fever of our own country presents, in the most intense cerebral affection with which we ever meet, there will always be present unequivocal indications of deranged function both in the heart and arteries, and in the organs of secretion and excretion: while in cases in which the brain may be tolerably clear; in which there may be little or no headache; little or no pain in the limbs; no delirium; in which the disease may be chiefly seated in the mucous membrane of the stomach and intestines, and the prominent symptoms be, pain of the epigastrium, tenderness on pressure over the whole abdomen, a red tongue, and frequent stools, still if we examine the state of the pulse, if we look at the quality and the distribution of the nervous influence, if we observe the operations of the sensorial faculties, we shall find these functions to be as truly, though not as intensely deranged as if the full force of the disease were spent upon the organs in which these functions have their seat.

Thus, although all these organs are invariably affected in every case of fever, yet in no two cases are all these organs affected in the same degree. Sometimes one system is more affected than another; sometimes one organ of one system, and these different degrees of affection, in these different systems, are variously combined and modified. How great, then, must necessarily be the diversity of symptoms presented by the different forms of fever! How incalculable are the varieties that result from difference of intensity alone. One degree of affection of the brain, for example, will occasion violent headache, constant watchfulness, great restlessness, a peculiar expression of the eye, and intolerance of light; in another there will be no headache, or none of which the patient will complain; there will be sleep,

though it be disturbed and unrefreshing; there will be no peculiar expression of the eye, and no intolerance of light. By one degree of affection, the sensibility will be rendered preternaturally intense; by another it will be totally obliterated; one will produce violent delirium, another, only slight wandering, or unrefreshing slumber; one, violence requiring restraint, another, profound coma. In the circulating system, the symptoms will alike vary. One degree will produce a quick, strong, and hard pulse; another, a quick, small, and feeble pulse; another, a slow and intermittent pulse. A similar diversity will be found in the temperature of the body; in one, the heat will be little changed; in another, it will be below the natural standard; in a third, it will be intense, and the organs of secretion and excretion will equally vary in the extent of their morbid changes.

Thus, from one and the same affection of one and the same organ, not only different but opposite symptoms will be produced in all the organs involved in what we may call the febrile circle. When to this variety are added diversities occasioned by various stages of the diseased processes that are going on in the system; by the previous state of the organs affected; by the reaction of the affected organs one upon another, producing innumerable and ever-varying combinations of different intensities of affection, in different sets of organs; and by the treatment to which the whole have been subjected, we cannot wonder if the symptoms of fever appear to be countless.

That no two cases of fever can be precisely the same, and that it must be vain to seek for the common phenomena of the disease in the external symptoms, must now be obvious; and why success can never attend the search after these common phenomena in such symptoms as 'shivering, frequent pulse, heat,' must be equally manifest. These, as well as all other symptoms, depend upon the state of the organs. But we have seen that in one degree of the same affection of the same series of organs, there may be shivering; excited pulse; burning heat; while in another there may be no shivering, a slow pulse, and a cold skin; so that from one and the same affection, differing only in the degree of its intensity, the symptoms may not only vary, but be directly opposite. The proper object of pursuit in all these inquiries, therefore, is the real nature of the affection, and the symptoms are of consequence only as they are indications of the existence of that affection. Symptoms are not *the* thing in which observation should terminate, but signs of the thing, without the knowledge of which, in every individual case that may come under his care, the practitioner ought never to be at rest, and to the discovery of which they serve as guides."—(*Treatise on Fever*, p. 40.)

The peculiarities by which Idiopathic Fever seems best to be distinguished, are thus described by Dr. Alison:—

"I. There is the *negative* fact, that in many of the cases to which this name is given, the general febrile symptoms,—the chilliness and lassitude, the subsequent reaction, and often long-continued acceleration of pulse and heat of skin, the thirst, anorexia, various uneasy sensations, and derangement of all the functions of the body (whether functions of the vascular or nervous system),—are unattended during great part or the whole of their progress by any such local symptoms,—such fixed and permanent local uneasy feeling,—or such peculiar change of the sensible qualities—derangement of the functions of any one part of the body, as justifies the belief that any individual organ is inflamed. And if these observations be thought ambiguous, on account of the occasional occurrence of cases of latent inflammation, formerly mentioned, the absence of local inflammation, in many such cases, is farther attested by the fact, to be afterwards stated, that they sometimes terminate fatally, without any satisfactory evidence appearing, on dissection, of inflammation of any part of the body; and very generally with so slight appearances of that kind, as are inadequate to the explanation of the fatal event.

II. Besides this negative observation, which applies only to a part of the cases thus named, there is the *positive* observation, applicable probably to all cases of idiopathic fever, although much more obvious in regard to some than others, that the *typhoid* symptoms, formerly shortly described, (and which may always be held to imply the action on the system of some cause distinct from mere local inflammation,) are distinctly to be perceived. These typhoid symptoms show themselves in one or other, but generally in several, of the following ways:

1. In the state of the Circulation, the pulse having very generally, from the commencement, or early in the disease, less strength or resistance to compression than in the fever which usually accompanies simple and decided inflammation, at the same period after the attack.

2. In the state of the Secretions, which are more deranged, and generally more diminished, than in inflammatory fever; as is sufficiently obvious in the fur on the tongue, and the secretions of the mouth, becoming viscid, dry, and dark-coloured; in the more complete failure of appetite; and generally, after a short time, in the greater dryness of the surface of the body, attended in most cases by a more pungent, though less enduring, heat of the surface.

3. In the state of the Nervous System, the greater tendency to stupor or confusion of thought, generally to be detected even in the commencement, and very obvious in most cases throughout most of the disease, often showing itself unequivocally in the later

stages by the involuntary voiding of the excretions which are naturally under the restraint of the will; the greater weakness, vertigo, and faintness on attempting exertion, in the early part of the disease, attended generally with much tenderness of surface and general soreness; the frequent tremors and subsultus tendinum, even when no exertion is made; the greater derangement of the external senses, particularly of that of hearing; the greater tendency to delirium, as the disease advances, and the usually peculiar character of that delirium, which extends to all the trains of thought in the mind, is unattended with propensity to violence, and is more or less blended with, or graduates into, stupor, and hence is generally designated by the epithets low, muttering.

4. In the state of the Blood, which is probably always so far altered in its vital properties, in Idiopathic Fever, as to coagulate less firmly than usual, and in some cases loses the power of coagulation altogether; in connection with which state we frequently observe more or less of the symptoms formerly called those of putrescency in fever, petechiæ or vibices, passive hemorrhages, and gangrene from slight irritation.

5. These symptoms, and especially the indications of nervous affection, and of putrescent tendency, are very generally sufficient to distinguish idiopathic from any form of inflammatory fever; but in many cases there is a farther positive distinction in the appearance of peculiar or *specific inflammations of the skin*, subsequent to the attack of the fever, which take different forms,—essentially characterizing the fevers that are designated as eruptive or exanthematous,—often appearing also in the simple continued fever,—but never forming any part of the constitutional symptoms that result from local inflammation exclusively.

III. A most important part of the history of what we call Idiopathic Fever, distinguishing it from the acknowledged effects of inflammation, is its much greater tendency to a *spontaneous favourable termination.* This is shown in different ways. In many cases the febrile symptoms return at regular intervals of 24, 48, or 72 hours; and subside completely after a cold and hot fit of some hours' duration, by a spontaneous sweating—constituting the *Intermitting* form of fever. In others there are equally distinct, but less perfect and less regular remissions of the symptoms, and the term applied is *Remittent* Fever. And in the remaining or *Continued* form of Idiopathic Fever, although we can observe only slight and partial abatement of the symptoms at different hours of the day, we very often observe complete recovery from the most urgent and distressing symptoms, taking place spontaneously at various periods of the disease,—sometimes, in the fever of this country, as early as the 7th or even the 5th day; sometimes not until the 30th, or even the 40th day, most generally

between the 10th and 20th; sometimes very rapidly, and with evacuations (whether at regular or irregular times) evidently resembling the sweating stage of intermittents; sometimes gradually, and without any such critical evacuations; but under very various treatment,—often without the use of remedies,—and always with less assistance from remedies, and with much less risk of subsequent organic disease, than where recovery takes place from an equally disordered state of the system, consequent on decided internal inflammation.

IV. There is this farther leading peculiarity in the cases of febrile disease, to which we give the name of Idiopathic Fevers, that they are often absent for a length of time, even from large communities, and again at other times, or in other districts, are extremely prevalent; and, therefore, evidently do not proceed merely from causes which are of general operation, as the exciting causes of inflammation are, but must necessarily result from causes of more local and temporary agency; and accordingly, we have good evidence, that all these idiopathic fevers either originate from a malaria, or propagate themselves, in part at least, and in certain circumstances, by contagion.

By attention to these particulars in the history of many febrile disorders, even independently of attention to the results of practice, we are authorized to conclude, that they may be distinguished from the effects of simple inflammation, and belong to the class which we call, for the present, Idiopathic Fevers; and that the *onus probandi* rests with those who would attempt to assimilate them to, or resolve them into, the acknowledged effects of inflammation."—(*Alison's Outlines of Pathology*, Am. Ed., p. 233.)]

II. FORMS OF FEVER.

Fever presents itself in a very great variety of forms. The most precise mode, perhaps, of regarding them in connection with one another, is to proceed at the outset from the simplest of them, Ephemera, or one day's fever.

Ephemera, so called because it seldom lasts above twenty-four hours, begins with chilliness or rigor, paleness, weariness, a frequent, small pulse, and indifference to food. These symptoms are followed in half an hour, or a little more, by heat of skin, flushed face, frequent, hard pulse, occasionally headache, and a peculiar sense of fatigue, restlessness, and slight soreness in the muscles, to which the name of febrile sensation, or febrile anxiety, has been conveniently given. When this state has continued for twelve, eighteen, or at most twenty-four hours, gentle perspiration breaks out; under which, in the course of little more than another hour,

every essential symptom vanishes, leaving behind some exhaustion, muscular debility, and feebleness of the appetite. This disease, the simplest and slightest of all forms of fever, although on account of its shortness it seldom attracts much notice, is, nevertheless, not uncommon during the irregular weather of our spring months in Britain.

If such an affection be supposed to recur several times every other day, with an interval of comparative health in the intervening days, a clear idea will be formed of Intermittent Fever in its most frequent and characteristic shape—the tertian type; and from the tertian may be derived all the other forms of intermittent.

If, in the next place, the febrile state be conceived to be reinforced twice a-day, or oftener, by a fresh attack of rigor or chilliness, with subsequent reaction, before the pre-existing pyrexia has materially subsided, a distinct conception may be formed of Remittent Fever.

From Remittent Fever most nosologists deduce the only remaining primary type, Continued Fever, by supposing the remissions to become gradually less and less distinct; and this view may seem so far conformable with nature, that almost all continued fevers present, more or less, a tendency to regular or irregular remissions, especially for some days at the commencement.

But it is, perhaps, fully a clearer, and certainly a more direct way of deducing them, to conceive the ephemera merely prolonged to such a duration, as that its several stages occupy between four and nine or eleven days, thereby constituting, in the first instance, the simplest of all forms of continued fever, usually known by the specific name of inflammatory fever, or Synocha.

It is probable that inflammatory fever is the fundamental type of all primary continued fevers. It is acknowledged that all primary fevers, but especially those of the continued type, even in its simplest form of inflammatory fever, present, in comparison with other febrile diseases, a great degree of debility, or exhaustion of the nervous system; which is marked among other symptoms by great muscular feebleness, both during the prevalence of febrile action, and for some time also during convalescence. Now sometimes, where inflammatory fevers are disposed to run a longer course than usual, the symptoms of nervous depression, aggravated undoubtedly by the pre-existing reaction of the circulating system, come to constitute, in the latter stage, the most conspicuous character of the disease; and in particular they veil more or less, and even sometimes overwhelm, the original character of pure reaction that distinguished the earlier stage, thus giving rise to extreme muscular depression, and disturbance of the powers of the mind in the shape of stupor, with or without delirium. Such a sequence of pathological phenomena conveys

the clearest idea of the second well-marked variety of continued fever in its simplest form, which is commonly known to nosographists by the name of Synochus. At other times, again, the symptoms of exhaustion and disturbance, becoming still more prominent, show themselves at an earlier period along with the signs of reaction of the circulation, that is, before the close or even near the beginning of the first week; and thus they constitute the most striking general character of the disease throughout, and in some cases even become excessive from the very beginning. Fever, in this shape, forms the Typhus of nosographists—a term, which of late has passed into unprofessional language, and thereby acquired a vague meaning, almost equivalent to the generic word, fever.

The three types of Continued Fever—Synocha, Synochus and Typhus—are the species which were admitted by Cullen into his nosological system. Since his time, some have called in question the existence of the first type; others have multiplied the species. Many have doubted, and not a few have boldly denied, that such a thing as a primary fever, properly so called, is to be found in nature. But all that has been attempted in this particular corner of the theory of fevers since Dr. Cullen wrote, has had scarce any other tendency than to embarrass and obscure the subject. Much has been done for the pathology of the various forms of fever by the researches of pathological anatomists; and the knowledge now possessed of its secondary affections has in consequence acquired an extent and precision, which in his days were unknown, and, indeed, unattainable. But the views entertained of fevers in the abstract have not been rendered clearer; and many dogmas have been maintained, and still receive currency, which, in so far as they do not seem true to nature, cannot be supposed likely either to advance medical theory, or to benefit medical practice.

All forms of continued fever, excluding always from that term eruptive fevers and acute local inflammations, may be arranged under the three types here specified. All forms which have been distinguished from them by medical writers in recent times may be viewed, both philosophically and practically, as nothing else than varieties, presenting peculiar features imparted by incidental concomitants, yet not the less essentially belonging either to one of the three Cullenian types of Continued Fever, or to Remittent Fever. There is some difficulty in assigning its true place to one particular variety, which, under the name of Yellow Fever, has deservedly attracted great attention, on account of its frequency in various quarters of the world, as well as the peculiarity of its nosological characters. But it is in all probability nothing else than a remittent, possibly, however, sometimes a typhoid continued fever, with incidental or secondary accompaniments. [Yel-

low Fever is a distinct form of Continued Fever, and consists of a single paroxysm, of variable duration, but never repeated. The evidence of Rush, Lining, McArthur, Wilson, Dickson, and other high authorities, is conclusive on this point, as will be more fully shown hereafter, when we come to treat of the disorder.]

There is also some difficulty in assigning a true place among primary fevers to those disorders, which have been termed in modern times gastric fever, and gastro-intestinal remittent. It seems well ascertained that the same irritations, which will excite local inflammation in the stomach or intestines, attended with symptomatic fever, may also at times excite the febrile state independently of positive inflammation. This happens particularly in the irritable constitutions of children, but may also occur in the more robust habits of adults. The fevers thus arising may generally be distinguished from the primary fevers of the continued type, unconnected with a local cause in the body, as well as from intermittents, and those commonly ranked as remittent fevers. But they tend in various circumstances to assume the form, sometimes of one, sometimes of another of these fevers; and are occasionally with difficulty distinguished. In a nosological arrangement, they form the passage, as it were, between primary fevers and febrile inflammations; and will be so considered in this work.

[Fever runs a determinate course, a paroxysm consisting of several stages. There is, 1st, The *Formative* or *Precursory* stage; 2d, That of *Invasion;* 3d, The period of *Excitement;* 4th, The stage of *Crisis;* 5th, That of *Decrement*, or *Decline;* and, 6th, That of *Convalescence.*

A. The *Formative*, or *Precursory Stage*, the *Latent Period*, the *Stage of Incubation* of the French, the *Dormant Period* of the English writers, was accurately described by Celsus.—(*De Med.*, lib. ii., cap. 2.) It would appear to be the result of the action of the exciting causes of fever on the animal frame. The earliest manifestations of the morbid impression are exhibited by the nervous system, and consist in general of languor and depression, with uneasy feelings; impairment or abolition of the natural appetites; and alteration in the secretions. The duration of this stage varies from twenty-four hours to several weeks. Its duration is said to be in inverse proportion to the severity and duration of the subsequent attack.

The subsequent stages are thus described by Dr. Copland:

"*B. Stage of Invasion;* (*a*) *The cold stage* of writers is attended by debility, lassitude, painful uneasiness, or sinking at the epigastrium, a sensation resembling cold running down the back, with formication or chills extending over the limbs and general surface. The pulse is constricted, small, weak, or accelerated; the respiration is slow, irregular, or suspirous, and attended by

anxiety at the præcordia, and occasionally by a slight dry cough. On these supervene gaping, sighing, pandiculation; a sense of weight, pain, or constriction in the head; giddiness, moroseness, depression of spirits, and disorder of the senses; lividity of the lips and nails; pallor of the skin; the cutis anserina, and shudderings, rigors, or shiverings, followed by, or alternating with, irregular flushes. After the rigors cease, a sense of chilliness often continues for some time, although the skin has become hot. These symptoms present various grades and modifications in the different types of fever; in some the feeling of cold is actually attended by reduction of the temperature, and in others the heat is not materially, if at all, diminished, or it is even increased. The former is most commonly seen in the cold stage of periodic fevers, the latter in the invasion of continued fevers. In all, however, the cutaneous transpiration is altogether arrested, and the skin is harsh and dry. The pulmonary exhalation is also diminished, and the breath is cold. Copious discharges of pale urine often take place, evidently arising out of the arrest of the exhalation from the skin and lungs. Loss of the appetites, costiveness, thirst, and occasionally sickness and vomiting, are likewise present.—(*b*) The *duration* of this period may be very short, or it may be for many hours alternating with slight flushes. The shorter and more intense it is, and the severer the rigors, the shorter and severer will be the consequent vascular reaction, and the more nearly approaching the inflammatory type; and the longer its duration, the more prolonged will be the fever. The imperfect evolution of this stage, or its slight occurrence, particularly when it is not attended by rigors, very generally indicates a severe malignant or typhoid state of disease. In some of the most dangerous cases of fever I have seen this stage so slight as to be confounded with the preceding one.—(*c*) The *pathological states* of the first period are increased in this, particularly the general depression of vital endowment; the impeded functions of the lungs, liver, &c.; the interrupted exhalation and secretion, excepting the urinary secretion: and the imperfect depuration and arterialization of the blood. But the lowered vital powers become more centralized, and the congestion of the large vessels, especially those of the thoracic and abdominal viscera, greater; conditions which terminate themselves by inducing rigors, shivering, vomiting, and reaction of the vascular system, with the subordinate phenomena of the next stage.

C. Period of Excitement.—a. Incremental excitement or reaction—incrementum vel augmentum morbi.—(a) This stage commences with the disappearance of certain of the foregoing signs, with the increase of those that remain, and with the supervention of others. Fever, in its more literal sense, now begins, and manifests its specific form. The gaping, pandiculation, formi-

cation, and rigors disappear, and the stricture and collapse of the countenance and general surface are followed by increased warmth and turgescence. The chilliness, however, continues for a short time. Pulmonary transpiration returns in some degree; respiration becomes full, frequent, and sometimes laboured, and the breath hot. The urine is now diminished, high-coloured, limpid, and clear, and its discharge is often attended by scalding. The muscular debility, feeling of fatigue or lassitude, the pains in the head, loins, and limbs, the thirst, and the anxiety at the præcordia, are all increased. The countenance becomes turgid; the eyes shining, but with an expression of languor; the cheeks flushed, and the cutaneous surface hot, burning, and turgescent. The appetites are now entirely abolished; the tongue is loaded or furred, or both; the pulse is free, full, and accelerated; often strong, and vibrating in the neck; but varies remarkably in tone with the particular variety of the disease. There are also a sense of weight, fullness, and aching of the head, with giddiness, confusion of ideas, and sometimes with mental indifference, which short and disturbed slumbers seem to aggravate; a morbid susceptibility or disorder of the senses; and occasionally moroseness, restlessness, or jactitation. These symptoms generally increase, often presenting in the continued type slight remissions in the morning, with exacerbations in the afternoon and evening, and which are most severe on alternate days; and, during the progress of this stage, delirium often supervenes, especially when it reaches its height.—(*b*) The *duration* of incremental reaction or excitement varies with the type and form of the disease, from an hour or two, as in ague, to two or three days, as in continued fevers. It is generally shortest in the most severe and violent attacks; but it never extends beyond seven days.—(*c*) It consists *pathologically*, of reaction of the vital powers, expressed chiefly in the vascular system, frequently with a preponderance or determination towards particular organs, of the efforts of life to overcome the more immediate effects of the exciting causes, especially the internal congestions, and the superinduced changes in the blood.

During this stage *determination* to particular organs or textures frequently occurs, and thus the fever becomes *complicated*, or resembles idiopathic *inflammation* the more closely, the less severely the vital power and the circulating fluids are impaired or vitiated. Such determinations or consecutive inflammations are observed principally in the *encephalon*, *spinal cord*, *lungs*, *liver*, *stomach*, and *bowels;* they are caused chiefly by the predisposition, previous diseases, and existing states of these viscera; and by climate, season, habits, and occupations, and the circumstances of the individual; whatever disorders, irritates, weakens, or causes habitual determination, or increased momentum of the circulation to either of these organs, thus complicating the fever. Hence the

cerebral complication is most common in the studious; the *gastric* and *hepatic*, in those addicted to the pleasures of the table or to intemperance, and in hot climates, or during warm seasons; the *pulmonary*, in cold countries and seasons, and in persons much exposed to the open air; and the *intestinal*, or dysenteric, in the ill-fed, in persons using unwholesome water, or living upon innutritious and watery food, and in low and moist situations. The *prevailing epidemic* constitution has also a most powerful influence; the complications, as well as the particular form and type of fever depending upon it, and the nature of the exciting, concurring, and determining causes.

β. *Stationary reaction—stadium coctionis* of the humoralists—consists of the persistence of the above symptoms, with slight modifications, and frequently with increased affection of particular organs. (*a*) During its progress, restlessness continues, with watchfulness; delirium is often constant, or appears for the first time; nervous power is gradually and almost imperceptibly exhausted; the pulse generally loses tone, and becomes more accelerated; the tongue is deeply furred and loaded, and often, also, parched, and mucous sordes collect about the teeth. Respiration is quick, or moaning, and the breath is foul, heavy, offensive, sickly, and loaded with vapour; the urine is still scanty, high-coloured, and clear; the bowels are either costive or irregular, and the stools morbid and offensive; the countenance becomes pale, heavy, collapsed, and of a sallow or unhealthy hue, sometimes muddy or lurid; the eyes are suffused, watery, heavy, and occasionally injected; the skin continues hot, pungent, or burning, and it afterward either evinces a disposition to transpiration, or becomes damp and clammy; or it is the seat of petechiæ, or of eruptions, which, in the exanthematous fevers, appear at an early part of this stage; the prostration of muscular power is increased, and is often so great that the patient cannot retain his position on one side, but falls into the supine posture; adipose matter is subsequently absorbed, and the body lives upon itself; and, if the patient be not delirious, he complains of severe pains, or of a bruised sensation, or of soreness in his limbs, back, and loins, with confusion, vertigo, or pain in his head.

(*b*) The symptoms vary remarkably in this stage with the type and form the fever assumes; with the complications above alluded to; with those which may supervene during the advanced progress of this period; with the more latent changes in the mucous surfaces, or in parenchymatous structures; and with various influences and circumstances occurring during the disease. In some varieties of the continued type of fever the whole of this period proceeds with little or no evening exacerbation, while, in others, exacerbations are very manifest; but this depends much upon the prevailing epidemic constitution. In general, feve

caused by infection, and complicated with serious visceral disease, or characterized by severe affection of the fluids and soft solids, is strictly continued; while that produced by terrestrial emanations assumes somewhat of the remittent form, although presenting much of the continued type.—(*c*) The *duration* of this state of vascular reaction is shortest in agues, in which it does not exceed a very few hours; and, in continued fevers, it is brief in proportion to the severity of the disease. It rarely, even in the more protracted cases, exceeds fourteen days.—(*d*) The *pathological states* of the early part of this stage continue, in great measure, in this part of it; but vascular action exceeds vital power, which is gradually lowered; and the circulating and secreted fluids, and the solids themselves, become vitiated, as already stated, and as will be more particularly shown in the sequel.

D. The period of Crisis.—Crisis in fevers is a sudden change taking place at a particular period of the disease and terminating it. A crisis is brought about chiefly by the efforts of nature, or, in other words, by the febrile action itself, inducing changes in the functions and organs productive of a salutary effect. Although it often takes place by the unaided efforts of life, it is frequently assisted by art, and should not, therefore, be preferred before art judiciously employed. The *critical days* are the 2d, 3d, 4th, and 5th (quotidian period); the 7th, 9th, and 11th (the tertian period); the 14th, 17th, and 20th (the quartan period). After the 20th, crises are obscure, and seldom occur till the 27th or 28th. Salutary changes are observed chiefly on the above, unfavourable changes on the intervening days; but death may happen on any day. A very cold climate or season, or either extreme of temperature, the impure air of a hospital, the continued operation of the causes, the complications, great vitiation of the fluids and solids, an active treatment, interfere with, retard, or prevent crises. If the exacerbations be well marked, and vital energy not very much reduced, a favourable crisis may be more confidently expected. Crises are sometimes *indecisive*, or consist of several abortive attempts before the end is attained, especially when the powers of life are much lowered. When several critical efforts are required, each succeeding one renders the task more easy for the next, until the disease is gradually subdued.

E. Period of Decline.—Sometimes the decline is prompt and rapid, especially after a marked crisis; at other times it is gradual and slow, particularly when only slight and imperfect crises have occurred, or when the disease terminates in resolution without any very manifest critical evacuation. In the former case, the decline passes quickly into convalescence; in the latter, this stage is often characterized by slight exacerbations, called by some writers posthumous crises, which are apt to be misunderstood. In the fevers of this country, which frequently decline gradually,

or in the second of these modes, the symptoms indicative of vital disturbance generally subside in the order in which they appeared. Organic nervous influence and the dependent functions are the first to be restored; the respiratory, secreting, and excreting actions become natural; the perspiration more general, free, and, if it have previously been offensive, clammy, or partial, more natural and genial; the tongue begins to clean on the sides and point, and is more moistened by the commencing return of the secretions poured into the mouth; coma and delirium subside, and the patient regains his power over the alvine excretions, if it has been lost; the sensorial faculties and sleep reappear, and the latter becomes more refreshing; the locomotive powers are freer and more energetic, the patient being enabled to turn upon his side, the sense of soreness and lassitude being diminished; the appetites and desires return, and the excretions are gradually re-established. The action of the heart is the last to subside to its natural frequency, and generally continues long afterward to be readily excited by slight stimuli. The urine is abundant, and deposits a copious sediment; the bowels become free, the motions consistent and feculent, and the skin gradually assumes a clear and healthy appearance; but emaciation increases rapidly, or now is more apparent; absorption, more especially of the less animalized and less highly organized parts or molecules, proceeding rapidly as soon as vascular reaction subsides.

F. Convalescence.—I agree with Richter and Hildenbrand in considering this as a stage of fever. The propriety of this view is obvious, especially as regards the future health of the patient. It is, however, altogether distinct from the malady, inasmuch as it does not present any of the constituent phenomena, which still continued to exist in the stage of decline, but merely those of debility consequent upon acute disease. During its early progress, the bulk of the body still continues to diminish, or does not increase until it is far advanced; all the symptoms entirely disappear; the appetites, desires, digestive functions, the secretions and excretions are re-established, but are apt to be disordered, and therefore require supervision; the cuticle and sometimes the nails are exfoliated, and the hair falls out. Irritability and sensibility often are increased; and tinnitus aurium is sometimes troublesome; but these subside as health is restored. *Relapses* are apt to occur in this period, especially from premature exposure or indulgences, or from disorder of the digestive organs; but they more rarely follow when fever arises from infection, or from a specific contagion, though other diseases may be thereby occasioned."—(*Dict. Pract. Med.*, p. 1046, Am. Ed.)]

III. LOCAL DISEASES IN FEVER.

Fevers seldom present themselves in actual practice with the simple characters, which, for the sake of precision, have been supposed in the preceding statement. The phenomena described above constitute the broader features by which they may be grouped in genera and species, for the purpose of convenient classification. But in special cases each kind of fever presents complications, by which its essential characters may be more or less obscured, and which become most important objects in the treatment—more important, frequently, than the febrile state itself.

These complications seem to arise from one organ or set of organs being disturbed in their function beyond the rest, owing to constitutional predispositions, or other incidental co-operating causes. There is scarcely any end to their multiplicity. But by far the most frequent and the most important of them may be classed under the general head of local inflammations; and the greater part of the remainder under that of local irritations. Local inflammation confessedly, and in all probability local irritation also, may subsist as a primary affection, giving rise to the febrile state as symptomatic or secondary to the local disturbance. But there can be as little doubt that such local disorders may likewise prevail incidentally in the course of primary fevers; that, although occasionally absent, their presence is, on the whole, the more general rule.

Local inflammation, in particular, has even appeared to some modern cultivators of pathology, to be so invariable an accompaniment of what are called primary continued fevers, that they have been led to call in question the existence of any true primary fever, and to maintain that fever of every kind is constantly a symptomatic affection—a phenomenon secondary to inflammation in some special organ. The doctrine here alluded to, which has gained not a few converts in this country, and which, on the Continent, but especially in France, seems at the present time to predominate,* is of so much consequence, both as striking at the very root of the theory of fevers previously current, and also as involving practical precepts of high importance, that a necessity arises for considering the subject in the present place in some detail. And the necessity becomes not the less urgent, if it be true, as appears highly probable, that the doctrine in question,

* [Such certainly is not the case at present either in Europe generally, or in France in particular. Dr. Christison has, we think, rather exaggerated the predominance of this doctrine in France at any time. The localization of fevers was always stoutly resisted by the most authoritative, if not the most numerous class of French Medical teachers.]

however spacious, and however widely disseminated, is in reality untenable, being founded, like many other hallucinations in physic, upon narrow, though so far as it goes, correct enough observation.

IV. NATURE OF FEVER.

It may be well to introduce this topic with a short historical sketch of the principal opinions which have at different times been held of the nature of fever. A preliminary statement of these opinions can scarcely fail to have at least one good practical tendency. The picture thus presented to the mind, of the successive revolutions of sentiment that have taken place as to the theory of fever, of the ingenious absurdities which disfigured the early history of medicine, and of the plausible, yet not less visionary substitutes, which the authorities in every new era of medical science have devised, rather to the discomfiture of their predecessors than to the stability of their own credit, should teach due caution in adopting the still newer devices of the present day, even though they do seem to be based on the sober discoveries of a faithful system of generalization, guided by a sound pathology.

The ancient physicians were naturally led by the more prominent and tangible phenomena of the disease, namely, the altered state of the several excretions, to imagine that fever essentially depends on a morbid state of the animal fluids. This doctrine, espoused at the revival of letters in the fifteenth century, acquired soon afterwards a more definite shape under the speculations of the alchymists; and fever was held to be the result of a contest between acid and alkali within the body. For a long time afterwards, the fluids or humours were almost alone looked to for an explanation of the phenomena of fever; and hence the followers of the doctrine then in vogue have usually been designated humoral pathologists, or *humoralists*.

[The ancients entertained the belief that in fever there was contest going on in the system between it and some noxious principle, either generated within the body, or introduced from without, which it sought to expel. Hence, some of their writers deduce the term *fever* from the Latin verb *februare*, to *purge or purify;* and esteemed it a salutary effort of nature, which should not be interfered with. Hippocrates, considering the increased temperature as the essence of "fever, founded his division of the varieties of the disease upon this principle, whence his *causus*, or burning fever, his *leipyria*, or fever with the parts externally cold and internally hot, and his *epialus*, or mild fever, with a simultaneous feeling of heat and cold; when he ascribed these different forms of fever to the superabundance of one or other of the four humours, blood, phlegm, yellow and black bile, and considered the

disease as the result of a contest on the part of nature to expel the morbid humour, or to render it inert or harmless by the process of concoction, the mind of Galen, so many centuries afterwards, was so well satisfied with this hypothesis, that his powerful genius contented itself with the mere amplification of the conjecture and the addition of similar conjectures of his own. Whence assigning the different sources by which a morbid heat, which he also considers as the essence of fever, may be excited in the body, he states 'that the fevers thus produced are modified by the prevalence or putrefaction of one or other of the four humours of Hippocrates; that of the three kinds of intermittent, the quotidian arises from the corruption of phlegm, the tertian from that of the yellow, and the quartan from that of the black bile; that in whatever part of the body the heat begins it ultimately extends to the heart; that as soon as this happens the general commotion of the vessels commences, and that in this manner nature is employed in exerting her powers, endeavouring to assimilate the good humours to the parts which are to be nourished, and to expel the bad; but that if at any time nature is unable to expel all the morbid humour, either from its thickness, its abundance, or its tenacity, or from some obstruction of the passage, or from her own want of power, it will necessarily undergo putrefaction, if it remain long in the body, and produce the most fatal effects unless it be expelled by process of concoction.' And so many centuries after Galen wrote, Sydenham, who brought to the study of medicine one of the most acute, upright, and independent minds that ever adorned it, commences a work on fever, which for fidelity of observation, for graphic description, for accurate discrimination, for bold and yet cautious treatment, has been justly considered an almost perfect model, with the following extraordinary assumptions:—

"That reason dictates that a disease is nothing else than nature's endeavour to thrust forth with all her might the morbific matter for the health of the patient; that seeing it has pleased God, the Governor of all things, so to constitute human nature that it may be fitted to receive the various impressions that come from abroad, it must necessarily be subject to many diseases; that these diseases proceed partly from particles of air ill agreeing with the body, which, having once insinuated themselves into it, are mixed with the blood, and affect the whole with a morbific contagion; and partly from various ferments or putrefaction of humours which are detained in the body beyond due time, either because it was not able to digest them, on account of the incongruity of their quality, or to evacuate them on account of their bulk; that these circumstances being so nearly joined to the human essence that no man can clearly free himself from them, nature provided for herself such a method and concatenation of symptoms as that she might

thereby expel the peccant matter, which would otherwise ruin the whole fabric; that the plague, for instance, is nothing but a complication of symptoms by which nature casts out the malignant particles, by imposthumes in the emunctories, or by some other eruptions, that were drawn in by the air: that the gout is nothing but nature's contrivance to purify the blood of old men, and to purge the deep parts of the body; that when nature requires the help of a fever, whereby she may be able to separate the vitiated particles from the blood, or otherwise expel them, either by a sweat, a looseness, or some kind of eruption, she accomplishes this object in the whole mass of blood, and that by a violent motion of the parts; that when this object is accomplished suddenly, either by the health or death of the patient, the disease is acute; when, on the contrary, the matter of the disease is of such a nature that it cannot have the assistance of a fever for the separation of it; or when this kind of matter is fixed to any particular part, which is unable to exclude it, or when the blood is vitiated by the continual flow of new matter into it, in these cases, the matter being very slowly or not at all concocted, the diseases which proceed from such unconcocted matter are called chronic: that acute diseases proceed from a secret and inexplicable alteration of the air infecting men's bodies; that these diseases do not at all depend on a peculiar crasis of the blood and humours any otherwise than the occult influence of the air has imprinted the same upon them; that they continue as long as this secret constitution of the air, and no longer; that they do not come at any other time; and that these constitute epidemic fevers; that on the other hand, acute diseases arise from this or that particular irregularity of particular bodies, which, because they are not produced by a general cause, do not, therefore, invade many at once; that this species comes every year, and at any time of the year; and that these may be called intercurrent or sporadic, because they happen at any time during the prevalence of epidemics."* (*Southwood Smith's Treatise on Fever*, p. 14.)

During the seventh and eighth centuries the Arabians attributed fevers to a superabundance of impure or thick blood, which they conceived to be connected with a similar state of the bile and other humours. They pretended to dilute the former by purging, and evacuate the latter by bleeding. Avicenna introduced some changes into the current theory of Galen. He attributed the phenomena of fever more to a superabundance of the different humours than to any change or degeneracy in their constitution.]

The doctrines of Humoralism held undivided sway over the minds of physicians, in one shape or another, till the close of the seventeenth century. About this period they constituted a part

* Sydenham's Works, p. 1, 2, &c.

of the theory of Stahl, who maintained that fever arises from plethora or fullness of vessels, and cacochymia or a depraved condition of the fluids; that it consists essentially of an effort of nature to get rid of these morbid states; and that the effort is accomplished under the direction of a soul—*autocrateia*, or governing principle within the body, which acts without any physical necessity, and purely through its own intelligence. [The idea of the influence of the archeus or vital principle in the production of fever originated with Van Helmont. (*De Feb.* c. xvi, p. 783.)] The theory of Stahl obtained wide circulation; like the doctrine which it displaced, it gave rise to grave practical errors. The views of the alchymists engendered a vain confidence in chemical remedies, for neutralizing or otherwise correcting the morbid condition of the fluids. The views of Stahl, by assuming the intervention of a free agent within the body, or an inherent *vis medicatrix*, inevitably led to an undue reliance in nature alone for the issue, and to the adoption of what has been aptly termed the *medicina expectativa*. So extravagant was the length to which his followers carried his principles in this respect, that some of them even established the sincerity of their creed by declaring their opinion that fever is a salutary operation, which scarcely merits the name of a disease—"*ne quidem morbum vocari merere.*"

The attempt made by Stahl to call in the aid of an intelligent governing principle to account for the phenomena of fever, probably gave rise to the first decided improvement in this branch of pathology, which consisted in some share of influence being allowed to the operations of the nervous system. For this step, as well as for delivery from the trammels of a pure Humoralism, medicine is mainly indebted to Hoffman. Hoffman maintained that fever consists in spasm of the capillaries, which engenders reaction of the circulation as the means by which the spasm is to be overcome; and he referred the cause of spasm in the capillaries to some morbid affection of the nervous system. In consequence of looking chiefly to an altered state of the solids as the essence of fever, Hoffman and his followers have usually been termed *Solidists*. To this theory Cullen afterwards gave more precision, by maintaining that the first incident in the chain of sequences constituting fever, is a depressed state of the brain and nervous system; that spasm of the extreme capillaries results from this depression; and that reaction of the circulation, with its accompanying phenomena, is an effort of the system to overcome the spasm. The Cullenian theory, in a modified form, continues still to be the prevailing creed of those who adhere to the tenets of Solidism, and who believe at the same time in the existence of primary or essential fever.

["Cullen, building upon the foundation laid by Hoffman,

rivaling in the number of his pupils, and exceeding in the brilliancy of his success, if not in the perpetuity of his fame, any name of antiquity, achieved with unexampled ease and suddenness this great revolution; and in opposition to the ancient theories taught, that the first change induced in the animal system, by the operation of the exciting causes of fever, is a diminution of the energy of the brain; that all the powers of the body and all the faculties of the mind, that the functions of sensation and motion, the processes of respiration, circulation, and secretion, all fail or are diminished in the general debility; that after a certain time a morbid increase of some of these functions, especially of the circulation, takes place with an augmentation of the heat; that these three states, that of debility, of cold, and of heat, bear to each other the relation of cause and effect; that the first state is the result of the sedative or debilitating influence of contagion, marsh miasmata, cold, or any other exciting cause, and the subsequent states the result of the first; that the debility produces all the phenomena of the cold stage, and especially a spasmodic constriction of the extreme arterial vessels; that this spasm or atony of the extreme vessels exists not only on the first attack of the cold stage, but remains during the whole subsequent course of fever; that the spasm of the extreme vessels throws a load of blood on the central parts of the circulating system, which proves a source of irritation to the heart and arteries, and excites them to a greater action; that this increased action, the source of the heat and the other phenomena which constitute the second or hot stage, continues till the spasm is relaxed or overcome; and that this excitement of spasm for the purpose of producing the subsequent reaction, is a part of the operation of the *vis medicatrix naturæ*, the innate preserving power of the constitution. 'Upon the whole,' says this celebrated theorist, 'our doctrine of fever is explicitly this. The remote causes are certain sedative powers applied to the nervous system, which, diminishing the energy of the brain, thereby produce a debility in the whole of the functions, and particularly in the action of the extreme vessels. Such, however, is at the same time the nature of the animal economy, that this debility proves an indirect stimulus to the sanguiferous system; whence, by the intervention of the cold stage, and spasm connected with it, the action of the heart and large arteries is increased, and continues so till it has had the effect of restoring the energy of the brain, of extending this energy to the extreme vessels, of restoring therefore their action, and thereby especially removing the spasm affecting them; upon the removing of which, the excretion of sweat, and other marks of the relaxation of excretories, take place.' "* (*S. Smith's Treat. on Fever, &c.*, p. 18.)

* Cullen, First Lines, S. 46.

In this system of the Edinburgh Professor, it has been remarked by Dr. Parr, that the production of spasm by debility is an isolated fact without a support, and the introduction of the *vix medicatrix naturæ* is the interposition of a divinity in an epic when no probable resource is at hand.]

Although the eminent reputation of Hoffman and of Cullen quickly attracted crowds of proselytes to the doctrines of Solidism, the ranks of the Humoralists were still by no means deserted. About the same period, Boerhaave, while adopting the principles of Solidism for the basis of his opinions, nevertheless admitted also the co-operation of chemical changes of the fluids in producing fever. Even Cullen himself allowed that, in certain circumstances, the fluids underwent morbid changes; but, in accordance with the principles first clearly propounded in the preceding century by Baglivi, he held that these changes were the consequence, not the cause, of the disease. In recent times an attempt has been made to revive the humoral pathology by a more accurate chemical examination of the fluids, and in particular of the blood. The facts which have been ascertained certainly seem to show that a morbid state of the blood may perform an important part, in developing some of the phenomena of fever. But the discoveries thus made are very far from bearing out the conclusion which has been drawn from them by some of the cultivators of this line of inquiry, for example by Dr. Stevens, that fever is entirely and fundamentally owing to the changes in question.

[Similar views regarding the agency of the blood in the production of fever have been entertained by Dr. W. Stoker, of Dublin. "Typhoid or adynamic fever," says he, "I consider to be generally symptomatic or morbid changes in the physical characters of the blood, and have, as on former occasions, stated what those morbid changes are—but I have arranged inflammation under the head of symptomatic fever, merely because it is more usually connected with some change in the structure of parts, discoverable after death; on the other hand, typhus fever is connected with morbid changes that *primarily* take place in the fluids, and produce morbid actions, and sometimes permanent changes of structure in the said parts. These changes, too, in the condition of the blood are distinguishable from those which we have stated to occur in inflammation; and the morbid actions excited relatively by those changes in the blood are also distinct. In inflammatory fever on the one hand, increased action, in typhoid fevers, on the other, debility is almost the immediate consequence. On account of this debility being an essential character of typhoid fevers, I denominated them adynamic."* This opinion was also advocated by

* Pathological Observations, &c., pp. 73, 74.

Dr. Burne. He states "that the adynamic fever has no local seat; that its nature is *a morbid condition of the blood*, produced by the operation of the primary cause, the respiration of a contaminated or poisoned atmosphere; that this morbid blood, acting on the brain and nervous system, is of itself sufficient, in very many instances, to bring about the very great derangement and imperfect performance of all the functions of the organic and of the animal life; which great derangement and imperfect performance of all the functions constitute the phenomena of adynamic fever."*]

So much attention has of late been drawn to the investigations of Dr. Stevens, and the facts on which his theory is founded, as well as the practical conclusions to which it leads, are of such a nature, that it is entitled here to more particular notice. According to his observation, confirmed by that of other practitioners in hot climates, the blood in the marsh-remittent of the West Indies, and in yellow fever, which he considers a variety of infectious typhus, undergoes important changes in constitution. Even for days or weeks before the disease breaks out, the blood, in persons who have been for some time exposed to the poisonous effluvia, is usually dark, its serum brownish or yellow, with colouring globules precipitated through it, and its venous tint incapable of being thoroughly turned to arterial red by contact with air or various salts. These morbid characters Dr. Stevens seems to suppose, though he nowhere states so categorically, are owing to a diminution of the saline ingredients of the blood—those ingredients which he was the first to prove, by a set of very interesting experiments, to be essential for a healthy process of arterialization in the lungs. As the disease forms and advances, this morbid condition of the circulating fluid increases. The salts become less and less abundant; and, in consequence, the blood becomes progressively darker, the serum more coloured, the clot looser and looser, like ill-made currant-jelly in consistence, and the modena tint of the venous blood less and less capable of becoming florid under exposure to air or saline solutions, till at length what is found in the dead body undergoes no change with either agent, or even with both together. These progressive changes he maintains to correspond invariably with the progress of malignant symptoms. And, on the contrary, it is alleged, that if the morbid state of the blood is encountered in time by the administration of natural non-laxative salts, allied to those usually found in the blood in its healthy condition, this fluid quickly recovers its healthy characters, amendment speedily ensues, and the mortality from one of the severest scourges of man in hot climates is reduced to a mere insignificant fraction. Dr. Stevens' theory, therefore, is, that the poisonous miasma of marsh-remittent, and

* Practical Treatise, &c., p. 161.

the infectious effluvia of yellow fever, alter the condition of the blood, especially by removing its saline ingredients; that this diseased state is the cause of such fevers; and, more particularly, that its gradual increase is the occasion of all the malignant symptoms, and of death. But he does not confine his inferences to the fevers which he has practically investigated. He holds in general terms, that "all essential or idiopathic fevers are primarily produced by a diseased state of the whole circulating current."—(*Observations on the Healthy and Diseased Properties of the Blood*, p. 148: 1832.)

It is impossible to enter here into the facts and arguments by which these views have been supported. Let it suffice, that the humoral pathology has thus been for the first time placed on something like a substantial basis. Dr. Stevens' researches go to prove, that the fevers of the West Indies originate in a diseased state of the blood. Propositions so important, however, cannot be adopted without strong confirmation. This they have not yet received from his transatlantic brethren, though his book has been before the world upwards of six years; and, meanwhile, they cannot but be viewed with distrust in Europe, when it is found, that, contrary to his general inference, they will not apply to fevers universally, but are at variance with what is observed in the typhus of Great Britain. For the blood in British typhus presents no marked disease at the beginning; its saline matter, though it diminishes as the disease advances, does not decrease out of proportion to the other ingredients, more especially the colouring principle; and, in the worst cases, to the very last, nay, even after death, the dark venous tint of the blood readily undergoes the usual change to arterial red under agitation with air, if that experiment be properly managed. But further, it certainly appears not a little extraordinary, that this theory should have been propounded in regard to the fevers of the West Indies, without actual experimental proof of the fundamental fact, a diminution, and disproportionately great diminution, of the saline materials of the blood. Nothing could have been easier to determine by analytic experiments; yet there is not a single analysis of febrile blood in the author's whole book, nor is it anywhere stated that such was ever made; and the loss of the salts of the blood is allowed to rest merely on inferential evidence or simple asseveration.

On the whole, it may be strongly suspected, that, like many of his predecessors who are blamed by him for the same error, Dr. Stevens has mistaken effects for causes. That important changes occur in the blood in the course of fever was partly known before by vague observation of its sensible qualities, and is now fully substantiated by his researches, and the experimental inquiries of Dr. Reid Clanny. [Dr. Clanny did not regard a vitiated state of

the blood as the proximate cause of fever, but an inability of the system to form blood. "The proximate cause of typhus fever," he says, "is a cessation of chylification, and consequently of sanguification, during which time the lymphatics of the whole system act with increased vigour, and in this manner the lymph taken up by them from the system supplies, for the time being, the place of the chyle in the blood, and as long as this state continues, the patient labours under an acute disease, heretofore called typhus fever. When the chylopoietic viscera resume their functions, the disease gradually recedes, and health is ultimately restored."* "Chylification, like secretion, is a function of the brain, which, under peculiar circumstances, or states of the atmosphere, is impaired, and in severe cases is suspended altogether; hence typhus fever."†]

But the alterations which have been hitherto ascertained, have by no means been proved to precede the fever. They are distinct, at least, only after the disease has prevailed for some length of time; they certainly become greater and greater as it advances; and consequently the presumption is, that they are its effect, and not its cause. It seems highly probable, that a careful investigation of the state of the blood and secretions, among the other secondary phenomena, will lead to important reformations of opinion as to many pathological details connected with fever. But the attempt to base a revival of the humoral pathology in its full force upon late chemical discoveries is premature, to say the least of it.

When the reputation of Solidism, and of the theory which refers fever to spasm of the capillaries was at its highest, a totally different doctrine was propounded by Dr. Brown, the countryman, and would-be rival, of Cullen. Dr. Brown supposed that all external agents possess the property of simulating a power inherent in the animal body, which he termed excitability; that the result of their action, when natural in degree, is health; that inordinate excitement produces fever, by causing exhaustion of excitability, or what he called direct debility; and that defective excitement has a similar effect, by occasioning accumulated excitability, or, in his language, indirect debility. Although this hypothesis presented much of the plausibility and flightiness which are apt to mislead imaginative minds, it never gained over many advocates in Britain. In Italy, it was for some time current. But there, as here, it was found to lead to the pernicious practice of treating all fevers alike by stimulants; and the observation of the injurious effects of this practice in some epidemics gradually overturned the doctrines whence it emanated.

* A Lecture upon Typhus Fever, by W. R. Clanny, M. D., p. 12.
† Ibid., p. 16.

[His theory differed, however, in no essential respect from that of his master. "Like his predecessor," says Dr. Smith, "Brown attributes all fevers to debility; and affirms that the distinctions which physicians have made about the differences of fever are without foundation; that they are all the same, differing only in degree; that the debility during the cold state is the greatest; that of the hot less; that of the sweating stage, which ends in health for a time, is the least of all; hence, in a mild degree of the disease, as cold is the most hurtful power, its effect is gradually taken off by the agreeable heat of the bed or of the sun, and the strength thereby gradually drawn forth; that the heart and arteries gradually excited by the heat acquire vigour, and at last, having their perspiratory terminations excited by the same stimulus, the most hurtful symptom is thereby removed, the hot fit produced, and afterwards the same process carried on to the breaking out of sweat; that the cause of all these diseases, from the simplest and mildest intermittent to the gaol fever and the plague, is the same with that of diseases not febrile, to wit, debility; differing only in this, that it is the greatest debility compatible with life, and not long compatible with it."

The Brunonian theory never became popular in the British schools, but prevailed to a considerable extent on the continent of Europe, especially in northern Italy. Razori, having visited Edinburgh, became an ardent admirer of Brown, and a warm supporter of his doctrines. Some years subsequently, a petechial fever having appeared at Genoa, the stimulating treatment of Brown was so fatal that Razori was induced to examine his theory more carefully; the result was a conviction of its errors and inconsistencies; and he finally abandoned it, substituting his own "new medical Italian doctrine," or the "doctrine of contra-stimulus," which attributes an opposite state of the system to fever from that imputed to it by Brown, and proposes a modified antiphlogistic treatment.

The views entertained, and so long taught by our distinguished countryman, Dr. Benjamin Rush, may not inappropriately be noticed here. We shall borrow the excellent analysis of them by the learned editor of the American edition of Dr. Copland's Dictionary. "As Dr. Rush confined the whole catalogue of diseases to a single class, and called the whole assemblage a *unit*, so also he reduced all fevers to one, maintaining that they differed only in *degree*, and that every form or variety of disease consists in *irregular action*, and that this irregular action, in its turn, is the approximate cause of every form or modification of disease. All the varieties of disease, according to his system, are owing to the difference in the state of predisposition, and in the difference in the force of the exciting or acting causes.

"Rejecting that part of Brown's doctrine which teaches that

debility, carried to a certain degree, is disease, whether occasioned by the abstraction of natural and customary stimuli, or by their excessive action, exhausting or expending excitability—which, in the former case, Brown called direct debility, and in the latter, indirect debility, and which he supposed required the application of stimuli of very different powers to restore the deficient excitement to a healthy grade—Dr. Rush held that debility, whether induced by the abstraction of stimuli, or by the excess of their action, is the only predisposing cause of disease. In both cases he supposes the debility which gives the predisposition to disease, is occasioned either by causes that abstract the stimuli necessary to support the healthy action of the several functions of the body (and the debility from these causes he calls the debility of abstraction), or by such preternatural or unusual stimuli as, after first elevating the excitement of the system above its healthy grade, and thereby wasting part of its strength, afterwards reduce it down to that state of debility which he calls the debility of action. And he considers the debility to be the same, whether brought on by the former or the latter causes; for the effect is an increase and accumulation of excitability, or an increased disposition to motion in both cases, and disease, or irregular action, the necessary consequence of the action of stimuli upon the excitability thus generated and accumulated. To apply these views to the subject of *fever;* as in health there exists a constant and just proportion between the degrees of excitement and excitability, and the force of stimuli, so in a predisposition to fever, as well as all other diseases which consist in debility and undue proportion of excitability, or preternatural disposition to motion, the ratio between the force of stimuli, excitement, and excitability is destroyed; in consequence of which the stimuli act with a force which produces *irregular action*, or in other words, *fever;* and when the excitability is comparatively more abundant in the blood-vessels than in the other portions of the system, which, from their being distributed in numerous and minute branches to every part of the surface of the body, both internal and external, is frequently the case, morbid, or irregular and convulsive motion is produced in them by the stimulating action of the circulating blood; for the equilibrium of the system being destroyed by the sudden abstraction of excitement, in consequence of the suspension of the natural and customary stimuli, the blood becomes unequally distributed, and, by acting with an increase of quantity and force in parts not accustomed to either, becomes an irritant to the muscular fibres of the blood-vessels, and thus an exciting cause of fever. When the excitability is redundant, and the natural or customary stimuli continue to act, the disease exhibits symptoms which indicate too much strength or activity, but more predominant in that portion of the system in which it has become comparatively more abundant than in the

other portions of the same; and when it is deficient the symptoms indicate too little strength and activity in the system, and particularly in that portion of it in which the excitability is comparatively more defective than in the other portions; and when either the quantity of the excitability or the force of the stimuli is in an undue proportion to each other, different degrees of excitement or power of action are the consequence. Rush maintained, moreover, that all the remote or predisposing causes of fever, and all other diseases, are *debilitating*, and all the occasional or exciting causes *stimulating*. Among the remote or predisposing causes of fever he enumerates cold; the debilitating or depressing passions of fear, grief, &c.; immoderate evacuations; famine, &c.; all of which induce debility, or a diminution of healthful power, by the abstraction of customary and salutary stimuli, in consequence of which the excitability accumulates and becomes redundant.

Among the causes which predispose to fever by the excessive or unusual application of stimuli, he mentions heat; intemperance in eating or drinking; inordinate exercise; violent emotions; marsh and human miasmata; contagions and poisons of all kinds; bruises and burns, &c.: all of these he supposes to act, by their stimulating power only, in the production of fever, although he admits that fever is frequently the consequence of the debilitating effects of the remote causes, without the application of any apparent stimulus, the circulating blood being sufficient, in such a state of excitability, to stimulate the arteries, and by producing *irregular action*, cause *fever*. 'Reaction,' says Dr. Rush, 'is thus induced, and in this reaction, according to its greater or less force and extent, consist the different degrees of fever. It is of an irregular or a *convulsive* nature. In common cases it is seated primarily in the blood-vessels, and particularly in the arteries. These pervade every part of the body. They terminate upon its whole surface, in which I include the lungs and alimentary canal as well as the skin. They are the outposts of the system, in consequence of which they are most exposed to cold, heat, intemperance, and all the other external and internal, remote, and exciting causes of fever, and are first roused into resistance by them.' In bringing about reaction of the blood-vessels, in which fever consists, Dr. Rush rejected the *vis medicatrix naturæ* of Cullen, and attributed it altogether to their elastic and muscular texture, being 'as simply mechanical as motion from impressions upon other kinds of matter.'* According to Rush, then, there is but *one fever*, and one exciting cause of fever, namely, *stimulus*. The phenomena of fever resolve themselves into a chain, consisting of the five following links: 1. Debility from action, or the abstraction

[* Medical Inquiries and Observations. By Benj. Rush, M.D., Phila., 1809. 4 vols.]

of stimuli. 2. An increase of their excitability. 3. Stimulating powers applied to them. 4. Depression. 5. Irregular action or convulsion; all the links being only perceptible when the *fever* comes on in a *gradual* manner." (*Dict. Pract. Med.*, Am. Ed.)]

The present century had scarcely dawned, before the sentiments of physicians as to the nature of fever became so divided, that it is scarcely possible to say what were the prevailing principles of any of the great medical schools of Europe. It would require an undue extent of space to follow here the particular views which have been entertained by the chief authors who have laboured in this branch of pathology during the last forty years. But it is necessary to take special notice of one doctrine, which forms, in various shapes, the groundwork of the principles maintained by a considerable proportion of pathologists for twenty-five years past, as well as in the present day. This is the doctrine already adverted to, which denies the existence of any primary or essential fevers, and holds them all to be merely symptomatic of some local disorder. The opinions referred to this head deserve careful attention, not less on account of the eminence of the men who have promulgated them, than because they are professedly founded, where alone sound views of the nature of diseases can be founded, in the investigations of pathological anatomy.

Early in the present century Pinel, the most acute and perspicuous of recent nosographists, while he advocated the doctrine of the essentiality of fevers, and carefully laid down the distinctions between those which are primary and those which are secondary to other disorders, nevertheless seems to have opened the door for the new theory, by assigning to each species of primary fever, admitted into his classification, a concomitant local disturbance. He held that inflammatory fever is connected with disturbance in the general circulating system, bilious fever with disorder in the digestive organs, a particular form of gastric fever with disease in the intestinal mucous follicles, nervous fever with derangement of the brain and nervous system, and typhoid fever with depression of the general vital powers—thus obviously, in some measure, localizing the disease.

Under the extended inquiries of pathological anatomists, it was soon ascertained that the morbid appearances to be found in fever are far more numerous and important than had previously been supposed; and, in the experience of some inquirers, certain appearances were found, as they conceived, to occur so invariably, and to correspond so uniformly with symptoms of local disturbance from an early period of the fever, that they were induced to consider such pathological derangements to be connected with the febrile state as its real cause. In this way were formed, on the one hand, the doctrine of Dr. Clutterbuck, published in 1807, that fever is not a primary affection, but essentially a local inflam-

mation, the seat of which is in the brain; and on the other hand, the theory of Broussais, announced in 1816, who, denying equally the primary nature of fever, maintained that its local cause is irritation, or inflammation, of the gastro-intestinal mucous membrane.

[Ploucquet was the first, it is believed, who assumed that inflammation of the brain was the source of fever. This doctrine was adopted by Marcus and Clutterbuck, who supported it with great skill and ingenuity. Clutterbuck maintained that fever of every kind and degree was the result of inflammation; and that all general derangements of the system can be referred to local organic disease. "Fever," he says, "in regard to its effects on the system, is the most general of all diseases, and gives rise, during its progress, to the greatest variety of symptoms. These, contemplated in the mass, present nothing but confusion. Like all complicated phenomena, they require to be subjected to strict analysis, that their order may be traced, and their relation to each other and to the exciting cause shown. To the neglect of this may be ascribed the error, as I conceive it to be, which has been so generally fallen into, of considering fever as a universal disease, or one that affects for the first time the whole system; no one part being supposed to suffer necessarily before the rest. Whereas, when the disease is minutely scrutinized, and its first appearance accurately noticed (which, indeed, from the slightness and consequent neglect of the first symptoms is rarely done) it will be found to be strictly a *topical* affection, the general disorder of the system being merely *secondary* or symptomatic of this."* "Out of fifty cases," he continues, "of which I noted down the symptoms with the greatest minuteness at the bedside of the sick, generally once and often twice in the twenty-four hours, throughout the disease, I find that no two of them correspond in the minute points, though they all agree in the essential one, that is, in a manifest affection of the brain and its functions; various in degree, and probably in extent, with numerous but accidental complications, from the affection of other organs."†]

The principles of Clutterbuck have met with few adherents among authors, and with still fewer proportionally among practitioners. But the hypothesis of Broussais, upheld by the enthusiasm and eloquence of its founder, and professing to rest on the irrefragable evidence of anatomical facts, quickly spread far and wide, especially among continental physicians. And although it is now confined within a much narrower range, it is still believed in by many, and may be truly regarded as the parent of several

[* Observations on the Prevention and Treatment of the Epidemic Fever, by Henry Clutterbuck, M. D., pp. 5, 6.
† Ib., pp. 11, 12.]

other forms, in which the doctrine of non-essentialism has been more recently offered to the profession, and in some quarters very generally espoused. Broussais—and in this respect his followers have shown themselves his apt and faithful pupils—took a summary view of gastro-intestinal derangement as the source of fever. For so long as he could find any trace of morbid alteration of structure in the stomach or intestines, no matter how slight or vague the appearances might be, he felt at no loss in ascribing the general disorder to a local cause. Others, however, have not been quite so easily satisfied. They believe that Broussais saw with the vision of a theorist; that he discovered structural changes invisible to other unprejudiced eyes; and that he frequently mistook, for true morbid appearances, the pseudo-morbid results of operations carried on in the body after death.*

In the course of testing, however, the accuracy of his doctrine by the means to which it owed its origin, namely, by appealing to the condition of the organs of the body after death, it was remarked, especially in certain localities, and above all in France, that one particular form of fever, more frequent and more important perhaps than any other, often presented itself in connection with an undoubted and formidable local disorder of the intestinal canal, which consists of inflammation of the solitary and conglo-

* [Broussais' exposition of his doctrine is as follows.—"On doit regarder comme nécessairement affectés, dans une maladie, les tissus dont l'irritation est constante durant la vie, et qui en offrent toujours des traces après la mort. Or, les phénomènes de la sur-excitation des muqueuses, et surtout de la gastrique, ne manquent jamais, dans le typhus febrile, puisque leurs symptômes sont identiques avec ceux des gastro-entérites sporadiques; tandis que ceux des autres phlegmasies ne s'y montrent qu'accidentellement. Ensuite, lorsque les personnes affectées de typhus ont le malheur de succomber, on trouve toujours ces membranes rouges, brunes ou noires, pendant que les autres tissus n'offrent d'alteration que dans certaines circonstances accidentelles; donc l'irritation des membranes muqueuses est inséperable du typhus febrile.

Les typhus febriles sont donc des gastro-entérites, ordinairement compliquées de catarrhes pulmonaires; ces deux phlegmasies sont le résultat d'un véritable empoisonnement, plus ou moins analogue à celui des champignons et des poissons gatées, et qui en a tous les caractères.

Le foie, principal annexe du canal digestif, est irrité secondairement, et sa sécrétion est plus ou moins augmentée. Plus le miasme est actif, plus cette lésion est marquée * * * * * plus la chaleur est intense, plus l'irritation du foie est inflammatoire (le fiévre jaune).

Le cerveau n'est inflammé primitivement que par l'effet de certaines circonstances qui ont fait predominer l'action dans son tissu; telles sont les affections morales, la nostalgie, les chaleurs, etc.; mais il souffre toujours beaucoup par sympathie et quelquefois au point que son irritation passé au dégré de la phlegmasie, et devient aussi grave que si elle etait primitive.—*Examen des Doctrines Médicals, par F. J. V. Broussais*, pp. 112—114.

Il n'y a de difference entre les gastrites qui sont ici dépeintes et ces fièvres, que celle qui depend du dégré; car les gastrites aigües qu'on ne peut pas arrêter arrivent toujours ou à l'ataxie ou a l'adynamie, dont les symptômes ne different pas de ceux du typhus. D'ailleurs, la gastrite, dont il est ici question, est deja pour les ontologists, une fièvre ataxique.—*Histoire des Phlegmasies, par F. J. V. Broussais.* Vol. III. p. 39.]

merate glands of the intestinal mucous membrane, leading on to ulceration. The existence of this disorder was indicated so early as 1762 by Roederer and Wagler, of Gottingen,* in the course of an epidemic fever which prevailed in that city. It was again attentively observed 1813 by MM. Petit and Serres at Paris.† But its anatomical characters and exact seat were first determined by M. Bretonneau, of Tours, who considered it a distinct disease, and termed it Dothinenteritis (δοθιὴν, a pimple, and ἔντερον, intestine).‡ And the first who investigated the relations of the local disorder with fever was M. Louis, the eminent physician of the Hôtel Dieu at Paris.§ M. Louis has been led by his extensive and minute pathological inquiries to the conclusion, in which very many pathologists, both among his countrymen and elsewhere, coincide with him, that the typhoid form at least of fever is always owing to inflammation of the glands of the intestinal mucous membrane; that dothinenteritis is the necessary anatomical character of typhus.

[Here are three misstatements. 1st. One of the chief objects of Dr. Louis' work is to prove the identity of *all* the species of the continued fevers of nosologists, with the *typhoid fever* of which he treats. 2d. Far from asserting that typhoid fever is *always* owing to inflammation of the intestinal glands, in no instance does he suggest or maintain such causation. His language is that these lesions are "inseparable from the existence of the affection under consideration, and constitute its *anatomical character.*" The difference between cause and anatomical character is wide. No pathologist who regarded the pustules of variola as its anatomical character, would be charged with viewing them as its cause. And 3d. Dr. Louis is inclined to the belief, that the character of the affection of the intestinal mucous membrane, is rather specific; hence it is incorrect to apply the unqualified term inflammation to the state described by him.]

Somewhat different from the doctrines of Broussais, as well as from those of Louis, yet based essentially on the tenets of the former physiologist, is the hypothesis of Professor Bouillaud. According to Bouillaud, fever is nothing else than an affection

* [De morbo mucoso, Gœttingæ, 1762.]

† [Traité de la Fièvre Entero-Mésentérique observée, reconnue, et signalée publiquement à l'Hôtel Dieu de Paris dans les années 1811, 1812, et 1813, par M. A. Petit, l'un des Médecins du dit Hôpital; composé en partie par E. R. A. Serres, &c.]

‡ [It is strange that the paternity of the name *dothinentèrite*, or *dothinenteritis*, as applied to typhoid fever, should have been so generally erroneously attributed to *M. Bretonneau.* M. B. styled the fever in question, *dothinentèrie.*]

§ [Recherches Anatomiques, Pathologiques, et Thérapeutiques sur la maladie connue sous les noms de Fièvre Typhöide, Putride, Adynamique, Ataxique, Bilieuse, Muqueuse, Gastro-entérite, Entérite Folliculeuse, Dothinentèrie, &c., comparée avec les maladies aigues les plus ordinaires. Par P. C. A Louis, Médecin de l'Hotel Dieu, &c. Deuxième Edition, Paris, 1840.]

symptomatic of irritation or general inflammation of the circulating system; inflammatory fever, one of the degrees only of this irritative or inflammatory state; and the other forms of supposed primary fever mere complications, arising sometimes from inflammation of the alimentary mucous membrane and its mucous follicles, sometimes from irritation of the cerebro-spinal system, and sometimes from the introduction of putrid substances into the blood. This strange hypothesis, much vaunted at present among the author's countrymen, and spoken of by himself with a degree of confidence which, with the exception of M. Louis, peculiarly characterizes the writings of the whole modern sect of non-essentialists, is obviously derived fundamentally from the hypothesis of Broussais, and engrafted with the nosological classification of Pinel, as well as the doctrine of Frank respecting the origin of inflammatory fever in inflammation of the arterial system.

Such are the leading opinions which have been entertained of late years by those who deny the existence of primary fever in general, or the primary nature of some of its forms. There can be no question that the essentialists, who look almost entirely to fever in the abstract, neglected too much the local affections which attend it, and to which so great importance has been attached by many in recent times. But it appears not less clear, that the non-essentialists have raised the importance of these local disorders too high, and have been led, by an excessive confidence in the visible indications of pathological anatomy to underrate the importance of the general febrile state. There may be a doubt whether all of the diseases which have been considered as fever by the numerous inquirers into this question, are really primary affections. It may in particular be doubted, whether the disorder described by Bretonneau and Louis is not a local disorder which simulates fever.* But at the same time it seems difficult for any one to survey dispassionately the whole facts, without coming to the conclusion, that fever is essentially a primary disease, and that most, nay, possibly all, of the local diseases which have been pointed out as its real source, are nothing else but secondary affections. From this conclusion it is doubtful whether the dothinenteritis of Bretonneau may be excepted. The arguments by which the opinion here advanced may be supported, are chiefly the following:—

In the *first place*, examples of the three forms of continued fever —synocha, synochus, and typhus—occasionally present themselves without any appreciable sign of local inflammation during life, or any corresponding appearance after death. Non-essentialists deny

* [This supposition, gravely hazarded, can hardly be imagined from one of Dr. Christison's ability. The reader will see, hereafter, innumerable and incontrovertible proofs of the disorder here alluded to being an essential fever.]

this, and say that the signs and appearances in question are often obscure, and have merely been not well sought for. There is an end, however, of all argument with such controversialists. The symptoms and appearances of local disorder, assigned by non-essentialists as the cause of fever, are now well enough known to every scientific physician, and are frequently seen by every practical man who turns his attention to the pathology of fever more especially in great hospitals. The argument advanced above is nevertheless still found to stand good; and the charge of wilful blindness may be met in the same strain by a charge of wilful delusion of sight. *Secondly*, the greatest proportion of cases of pure fever occurs in that form of it, where local inflammation would naturally be expected to be most frequent, that is, in synocha. *Thirdly*, the greatest proportion of cases of concomitant local inflammation occurs in the circumstances where exposure to the causes of fever is most associated with exposure to the causes of local inflammation. Thus, instances of pure fever are proportionally much more frequent among the better ranks than among the working-classes: and that there may be no fallacy in this argument, from the possibility of the kind of fever being different, it may be added, for the sake of limiting the statement, that the fact is observed to hold remarkably in respect to medical pupils and practitioners, who take fever by infection while attending fever patients in hospitals and dispensaries, and where no doubt whatever can exist as to the identity of their diseases with that prevalent among people of lower condition. Thus, too, instances of pure fever are much more common among cases of relapse, than among first attacks; a circumstance quite unaccountable on any other principle than that local inflammation is secondary to fever, and arises often from simultaneous exposure to the cause of fever, and to the causes of inflammation. *Fourthly*, in a great proportion of instances, where local inflammation does occur in fever, it is secondary in point of time. It does not occur till the fever is fully formed; at least signs of its presence cannot be detected for some time afterwards, and often not for a very long period. As a corollary from this fact it would follow, according to the doctrine of Essentialism, that local inflammations are least frequent where the fever runs a short course; and this is actually found to be the case. *Fifthly*, where signs of local inflammation do show themselves, they often abate and disappear, without the general fever being in the slightest degree subdued, or prevented from running its usual course, though that may be very long. *Sixthly*, on the contrary, the symptoms usually considered essential to primary fever may gradually disappear, and yet the local inflammation may continue with its peculiar signs, and come independently to one of its customary terminations. *Lastly*, local inflammation of every sort may occur during fever; and, never-

theless, the grand features of the febrile state are essentially the same. We perceive the signs of chronic or of acute inflammation developed in one or another of almost every important internal organ of the body; but still, in a genuine case of fever, no experienced physician can be at any difficulty to point out other symptoms common to all, and not necessarily connected with inflammation of any organ. The conclusion seems irresistible, that there is something else in the disease independent of the local disorder. The general fact here adverted to has been the evident source of much embarrassment to the non-essentialists, since they cannot agree among themselves what is the precise local seat of the cause of fever, some assigning the brain as its seat, some the glands of the intestinal mucous membranes, some the mucous membrane itself of the whole gastro-intestinal canal, and some of the general circulating system.

[In taking the same view—that Idiopathic Fevers are specifically distinct from strictly inflammatory diseases, and cannot be ascribed to inflammatory action as their cause—Professor Alison holds this language:

"I. The peculiarities of the occasional and local production, and application to the living body, of the exciting causes of these fevers, and of the characteristic depressing agency on vital action, which attends them, evidently assimilate, in some degree, this form of disease to the agency of poisons. Now, it appears from what was stated formerly in regard to all such poisons as act gradually, and must be absorbed into the system before they take effect, that although they may excite local inflammation, yet they have always a *general* effect, and usually a depressing effect, on vital action, whether of the nervous or vascular system, independent of that local agency. From this there arises a manifest presumption that the agency of malaria and of contagion, in producing fever, will in like manner be, in part at least, exerted on the system at large, and independently of local inflammation, or mere alteration of the distribution of the blood.

II. Although it is admitted that appearances indicating inflammation are very frequently found after fatal fever, yet the facts already stated as to the morbid anatomy of fever justify our maintaining, *first*, That all such appearances are sometimes absent; *secondly*, That the indications of inflammation, found in the different parts above enumerated after fever, are very generally somewhat different from those which are found after inflammations of the same parts excited simply by cold, and unconnected with the peculiar symptoms of fever; which implies the action, in cases of fever, of a peculiar cause, distinct from inflammation; and, *thirdly*, That the appearances of inflammation, found after fever,

are very often quite inadequate to explain the fatal event, on the principles formerly stated as to the fatal terminations of inflammatory diseases.

It is plain that, in order to prove that fever depends essentially on, and is fatal by reason of, the attendant inflammation, it is necessary to show, not only that such attendant inflammation exists, but that its nature and situation are such as to obstruct some function necessary to life,—or at least such as are found, in other cases, incompatible with life. If, therefore, we find, after fatal fever (characterized by typhoid symptoms), marks of inflammation in certan organs, but these in a degree much less than those which we are accustomed to find, where the same parts have been inflamed, but the characteristic typhoid symptoms have not shown themselves, we are not entitled to infer that the inflammation in the former case was the cause of death.

Now, the effects and indications of inflammation, found after fatal fevers, and already described, are generally *much less* than what we are accustomed to observe in those cases of inflammation of the same parts which are unconnected with malaria or contagion, and unattended with typhoid symptoms; and frequently all that is seen indicates only congestion of blood, which can hardly be held to be a sufficient cause for death, if existing alone, anywhere but in the brain, or at the origins of the nerves.

Even, therefore, where the evidence of inflammation, or irregular distribution of blood, having existed during fever, is held to be decisive, the proof of these having existed to a degree which can be reasonably considered adequate to the explanation of the fatal event, is very often essentially defective.

III. Not only the fatal event, but the chief peculiarities of the symptoms, of the diseases described under the name of Idiopathic Fevers, are very often inadequately explained by reference to any of the known phenomena and effects of inflammation.

The different authors who ascribe fevers to inflammation as their cause, are not agreed as to the organ in which that inflammation must reside; which circumstance is of itself a presumption against their common doctrine. But there is no locality which can be assigned to the inflammation attending fever, which can explain, by reference to the known effects of inflammation in other cases, many of the typhoid symptoms of fever.

The preternaturally fluid state of the blood, which is very often, although, perhaps, not uniformly observed, certainly cannot be explained thus. The enfeebled state of the circulation in typhoid fever has been thought by some to be sufficiently explained by the known sedative effect of inflammation of the intestines on the heart's actions; but, besides that, there are many cases of truly adynamic fever, where no distinct traces of intestinal inflammation

can be detected, the two cases are very different;—the depressed state of the circulation in cases of simply inflamed intestines being preceded by much more decided local symptoms than we see in fever, and being neither attended with the cutaneous heat of fever, nor with the eruption, nor with the foul dry tongue and lips of fever, nor with the nervous symptoms of fever, nor with the strong salutary tendency of fever. And although some of the symptoms produced by inflammation of the brain resemble the nervous symptoms of many cases of fever, yet in simply inflammatory cases, there are more sudden and violent attacks of pain,—there are very generally sickness and vomiting—there is at one period of the disease slowness or irregularity of pulse,—the delirium is of a different character,—there is less stupor in the early stages, and the stupor in the latter stages is attended much more generally with dilated pupil, squint, blindness or double vision, and is much more uniformly fatal than in the fevers described as idiopathic.

Farther, the appearances indicating inflammation, which are found after death by fever, are in many cases observed to correspond, not to any of the symptoms of the earlier periods of the fever, but to symptoms which presented themselves only recently before death; so that the period of accession, as well as the nature and degree of the inflammation, that can be ascertained to exist during the fever, is inconsistent with the supposition of all the symptoms depending upon it.

In farther proof that the characteristic symptoms of fever are not explained by the inflammations which may accompany it, we should observe, that there are various cases, formerly noticed, besides that now in question, in which inflammation is attended with typhoid fever; *e. g.*, the case of inflammation from an injury attended with violent concussion, the case of inflammation and purulent effusion in a vein, the case of inflammation from a poisoned wound, or from epidemic erysipelas, or other exanthematous disease, or puerperal fever; and in every one of these it is obvious that the system is subjected to the influence, not only of a local inflammation, but also of a cause acting generally on the body, as we suppose the poison of what we call Idiopathic Fever to do.

And if the local inflammation, which can be ascertained to take place during fever, is inadequate to explain the characteristic typhoid symptoms, it is equally in vain to seek an explanation of these symptoms, as some have done, in the mere circumstances of irregular distribution and congestion of blood.

Even the peculiarities of that form of fever which has been described under the name of *Congestive*, are not to be explained by the mere circumstance of internal congestion, the existence of which, in the vessels, and especially in the veins of internal parts, in these circumstances, is admitted. For although congestion or stagnation of blood within the cranium may be held to be a suffi-

cient cause of stupor, yet we are so far from regarding congestion in the great veins leading to the heart as a sufficient cause for deficient action there, and consequent feeble pulse and cold skin, that we have already stated the accumulation of blood in the great veins to be apparently the chief cause of the *increased* action of the heart, or the *reaction*, in the more usual form of fever. In the cases, therefore, where the congestion in the great veins fails to excite this reaction in the heart, some peculiar cause must have operated to prevent the heart from being usually excited, by the application of the unusual quantity of its natural stimulus; *i. e.*, the circumstance of unusually great and permanent congestion in the great veins, in the commencement of fever, is in all probability the effect, not the cause, of a peculiar sedative influence affecting the vascular system in these cases; such an influence naturally leading to accumulation of blood in the great veins, for the same reason that determines the accumulation there after death.

That congestion of blood in the great veins is not *per se* adequate to account for the phenomena of any form of fever, appears distinctly from the fact, that no form of fever follows the great congestion there in cases of suspended animation in syncope, or from extreme cold, or submersion in water.

IV. That what we called Idiopathic Fever cannot justly be regarded as the effect of the inflammations often attending it, appears farther from a very sufficient experience of the *juvantia* and *lædentia*, particularly from what is well ascertained of the effect of evacuations on the one hand, and of stimulating remedies on the other, in this disease, as compared with the diseases that are acknowledged to be simply inflammatory. For after making allowance for the sources of fallacy necessarily attending such observations, we may assert that experience has fully established the following points.

1. That in the strictly inflammatory diseases, evacuations of blood are of the utmost use in the early stages, all other remedies comparatively inefficient, and stimulant remedies decidedly hurtful in all but the latest stage.

2. That in the cases described as idiopathic fever, even although symptoms of local inflammation be present, the amount of evacuation which it is safe to practice on account of these is much less than in the former case; that its beneficial effect is less decided,—the local symptoms being seldom so effectually subdued, and the general, especially the typhoid symptoms, being seldom improved, and sometimes evidently aggravated by loss of blood; that the tendency to a spontaneous favourable termination is much stronger; and that even when indications of recent local inflammation exist, decided benefit may often be obtained from the use of stimulants,

under which the pulse may improve, and the typhoid symptoms of general fever abate, without the local affection being materially or even perceptibly aggravated.

It is also ascertained by sufficient experience, that the inflammatory symptoms are more urgent, and evacuations in general much better borne in some epidemics of continued fever; and that in others the indications of debility of the vascular system are more permanent, and stimulants more generally useful; while no such differences are observed as to the strictly inflammatory diseases in different seasons.

These statements seem sufficient to show, that it is a limited and hasty view of the phenomena and history of Fevers, which has suggested the opinion of their being resolvable into the constitutional effects of the Inflammations, or local determinations and congestion of blood, which can be ascertained to attend them; and that we may now safely apply the term Idiopathic as expressing the belief of an essential distinction existing between these fevers, and those that were formerly described as resulting from local inflammation.

At the same time, the strong similarity or coincidence, in many respects, of the essential symptoms of the symptomatic and the idiopathic fever, must always be regarded as a leading fact in reference to the pathology of the latter." (*Outlines*, &c.)

Another evidence of the want of identity between fever and inflammation is the peculiar state of the blood often, though, perhaps, not uniformly observed in fever; and which is directly opposite to that invariably present in genuine inflammation. In every inflammation there is a relative increase of the fibrin over the red globules. According to Andral, the fibrin of the blood in fever, uncomplicated with acute inflammation, is never increased; it remains at the physiological standard, or decreases;* and this to a degree never met with in any other acute disease.

* [A frequent coincidence in fever is the diminution of the fibrin of the blood, and the facility with which congestion (so often confounded with genuine inflammation) is produced. The circulating mass being deprived of its ordinary quantity of fibrin, the red corpuscles seem to lose at the same time the power of regulating their movements, and accumulate and stagnate in the capillaries. There is a peculiar congestion, which according to Andral is invariably connected with the typhoid state, whatever the disease may be. Its seat is the spleen, which becomes remarkable both from the increase in its volume, and the diminished consistence of the matter which fills its cells. Softening of the spleen in such cases is not due to any alteration of the tissue itself, for when by washing, the organ is emptied of fluid, it is found natural. It is the contained matter which has lost its consistence, and this is coagulated blood, retained in the areolar tissue of the spleen. Like all blood poor in fibrin its coagulation is imperfect. The same condition of the blood in similar states is found in the clots in the heart and great vessels. Hence the enlargement and softening of the spleen which accompany all well-marked typhoid symptoms, may be considered as the effects of the diminution of the fibrin of the blood.—(*Hèmatologie Pathologique*, p. 71, 1843.)]

The alteration in the intestinal glands, (a common complication, or frequent accompaniment of continued fever,) and the eruptions in the exanthemata, have no effect in increasing the proportion of fibrin. Every form and variety of fever, in every degree of intensity, will arise with every possible proportion in the globules. The blood is never buffed in simple fever, in continued fever, variola, scarlatina, or rubeola (Andral). The specific cause which produces fever, acts upon the blood in such a manner, as to tend to destroy the coagulable principle.]

The statements of fact here made are consonant, it is apprehended, with the experience of every British physician, who has been practically conversant with the phenomena of continued fever, as they have been presented on the great scale in the hospitals of this country during the last twenty years, since the appearance of the great epidemic of 1817. At all events, nothing has been stated above which has not been verified again and again, during that period, throughout the repeated epidemics which have prevailed in Edinburgh. The epidemics of fever, which have occurred in that city during the interval in question, have presented a very great variety of type or constitution, having gradually varied from the inflammatory form which characterized the earliest epidemic, to the typhoid character which is at present (1838) dominant. The opportunities of observation may, therefore, be safely said to have been peculiarly favourable. The facts are as already given. The result, it may be added, has been, that not a single observer, who has enjoyed these opportunities throughout, is to be found in the ranks of the non-essentialists. It may be granted, that truth is not to be put down by authority, however consentaneous. Yet, nevertheless, a circumstance of this kind is not without its weight in the argument, more especially when it contrasts singularly with the result as to medical opinion in other great cities, such as Paris, where physicians have plainly formed their conclusions regarding the nature of fever in the abstract from observing the characters of a single form rarely presented in the epidemic shape.

[This assertion is erroneous. The description of Roederer and Wagler was founded on an epidemic at Gottingen; that of Cruveilhier was drawn from epidemics at Paris in 1814, 1815, and at Limoges in 1816 and 1817. In all the epidemics in the French provinces, the special intestinal lesion was observed; also at Geneva; and in numerous epidemics throughout the European continent; to say nothing of those in Great Britain and Ireland, as will be shown hereafter.]

The arguments thus adduced against the supposed dependence of fever on local disorders at large are equally applicable to each particular disorder, which has of late been pointed out by pathologists as its cause. They may be applied, for example, to the

dothinenteritis of Bretonneau, the only cause, according to M. Louis and many others, of true typhoid fever [see p. 54]. This local affection, though comparatively rare in Edinburgh, is well enough known to every practitioner of experience as an occasional accompaniment of typhoid fever, especially in times when there is an epidemic tendency to diarrhœa and dysentery. It has been recognized, by the same symptoms during life, and ascertained by the identical appearances after death, which have deservedly attracted so much attention in the French capital. But it has proved invariably secondary in point of date: its appearance and disappearance in special cases have repeatedly been observed to exert no influence on the essential features of the general febrile state: it has been occasionally seen to continue, with its proper local signs, long after the general fever had come substantially to an end, sometimes in that case undergoing a cure like the fever before it, sometimes, on the contrary, proving fatal; it has been met with precisely in the circumstances in which cases of apparently pure fever were at the same time engendered, that is, in families suffering generally from typhus without any intestinal disease; in cases where, judging from the symptoms and morbid appearances, it was entirely wanting, which cases have uniformly formed an overwhelming majority, the general fever has been precisely of the same character, and very often precisely the same in degree, as where the local disorder was present: and, in conclusion, the intestinal disease has repeatedly presented itself in groups;—the *constitutio dothinenterica*, to speak in nosographical language, has repeatedly appeared and disappeared as a subordinate or intercurrent epidemic in the course of the more general epidemic, typhus, without the great features of that epidemic being altered in any material respect.

[The current opinions in some portions of Europe, especially Germany, as taught by J. P. Frank and Hildenbrand, are thus described by Dr. Copland. Frank "confesses that he despairs of conveying any exact idea, or even of coming to any satisfactory conclusion, respecting the proximate cause of fever. He thinks, however, that fever may be viewed as resulting from irritation induced by an unaccustomed stimulus; the powers of life reacting or making efforts at reaction, in order to remove it. Hildenbrand states nearly the same proposition in different words, in concluding that the cause of fever is to be found in a morbidly increased reaction of the vital forces, owing to the irritation of a morbific stimulus. He farther remarks, 1st. That all fevers are caused by an absolute or relative irritation, and, consequently, that they are all at their commencement irritative; 2dly. That the reaction of fever never follows mere debility, although it is attended by debility; and that the debility of the vital powers is always secondary, and the effect of the morbid irritation, or adventitious,

as in the progress of the disease. Admitting that it is difficult to explain—although I think it quite possible—how reaction of the vital forces can take place in the system in consequence of a cause primarily producing debility, more especially in the part where the impression is primarily made; still it is evident that all the causes of fever are not positive stimuli or irritants in their primary action, and, consequently, that their immediate effects on the surface to which they are applied are not exciting. Indeed, we have no evidence that the effects which are proximately consequent upon their application, are similar to those which uniformly result from those stimuli with the action of which we are acquainted. Stimulating effects undoubtedly follow remotely in a majority of instances; but they supervene in consequence of intermediate operations taking place in the system itself.

The opinions of Dr. Jackson are not materially different from those of Hildenbrand. He considers the material cause of fever to be of an irritative kind; that it enters the body by the absorbents of the first passages, proceeding into the circulation; and that it produces the febrile act by irritating the extreme series of organic capillaries, thereby occasioning subversion of the existing mode of action, and giving rise to changed or unnatural forms of action, through which the different secretions and functions are diminished, increased, or modified, in various ways and degrees."]

The errors of pathologists in investigating the question of the primary or secondary nature of fever seem to have mainly arisen from a circumstance, to which several other important errors that have lately gained currency are equally owing, namely, from limited observation, extensive enough perhaps in one sense, but limited in so far as it comprised experience of the phenomena of the disease in one locality only, and often, too, in one epidemic of that locality.

The fate of preceding theorists holds out small encouragement to any author of the present day to embody his own views of the general doctrine of fever. But some statement of the kind is nevertheless necessary for imparting a thorough idea of the spirit in which he communicates details, because no man perhaps ever wrote or practised in fever, without being more or less guided by one doctrine or another. The theory of fever, then, which seems most consonant with the whole facts, with the general sentiments of the Profession, especially in Britain, and with a sound and prudent practice, is probably the following.

Fever is an essential or primary disease. [It is, in the language of Fordyce, "a disease which affects the whole system; it affects the head, the trunk of the body, and the extremities; it affects the circulation, the absorption, and the nervous system; it affects the skin, muscular fibres, and the membranes; it affects the body, and affects likewise the mind. It is therefore a disease of the

whole system, in every kind of sense. It does not, however, affect the various parts of the system uniformly and equally, but on the contrary, sometimes one part is much more affected, compared with the affection of another part. Sometimes those parts which were most affected at one time, are least affected at other times, so that the appearances which are the principal ones in one fever, are by much the slightest in another, or sometimes are totally absent." (*Fordyce on Fever*, p. 16, 2d Am. ed. 1823.)] The first appreciable event in the chain of sequences constituting fever is a functional injury of the nervous system. The only essential or invariable consequence of this affection is functional derangement of most of the important organs of the body, but more especially of the brain, the circulating organs and fluid, the alimentary canal, and the skin. The characters of fever vary in some measure from year to year, and in different places, owing to unknown causes, which, for convenience, have been included under the generic term "epidemic constitution." The variations in its character, constituting varieties of primary type, probably depend on differences in degree in the primary functional derangement of the nervous system. Other variations, consisting in the undue development of special local disorders, whether functional merely, or passing into the organic character, or truly organic, depend partly on epidemic constitution, partly on manifest concurring causes acting at the moment of invasion of fever, or in its course. The changes which have hitherto been observed to take place in the blood and other animal fluids, are, like the local disorders, secondary and not primary: they may be the source of the phenomena remarked in the advanced stage of the disease, but they are not the source of the disease itself in the first instance. The preceding principles are, in correct philosophical language, matters of *theory*, capable of being decided by facts so soon as pathologists are agreed respecting the facts. If we wish to advance a step further, and tread in the regions of *hypothesis*, then it seems a reasonable doctrine, that the primary disturbance of the functions of the nervous system acts first on the capillaries or extreme vessels of the surface, as well as throughout the internal organs, and produces, not spasm, as was imagined by Hoffman and Cullen, but rather, according to modern views of the state of the capillaries in inflammation, a state of atony, relaxation, and distension, and consequently obstruction to the passage of the blood; that the disturbed state of the circulation is an effort excited by the stimulus of this obstruction for accomplishing its own removal; and that the disturbance of the function of circulation is variously modified by the constant co-existence and direct influence of the disturbance of the nervous functions. At all events there seems no question, that there are always two leading phenomena in fever, howsoever induced—disturbance of the nerv-

ous system and disturbance of the circulation: that, howsoever connected originally in the chain of sequences, they act and react on one another; and that their co-existence and reciprocal action, while they account on the one hand for many subordinate phenomena which are otherwise unintelligible, must on the other be kept constantly in view as modifying singularly the effects of remedies, and therefore regulating, in many essential respects, the method of cure.

[With regard to the morbific cause which produces and maintains the peculiar characters of febrile phenomena, some important points are to be considered. Having elsewhere* expressed our concurrence in the pathological views of Professor Alison on this subject, we shall transfer them to these pages:

"I. It may be questioned whether the effect on the Nervous System, essential to fever, is produced directly by the external cause of fever, or whether that cause first works a change on the blood, and through its intervention affects the brain and nerves.

It is plain that the blood is changed, at least as to its power of coagulation, in most cases, and probably it may be so in all cases of idiopathic fever. But a similar change as to that property may be produced in it, by causes acting in the first instance on the Nervous System; and this fact, therefore, does not indicate the part of the system which is primarily affected in fever.

Reasons which appear, on first consideration of the subject, satisfactory, may be given against the supposition of many of the older pathologists, that fever essentially and exclusively *consists* in a certain change in the blood, (quæ præsens morbum facit, sublata tollit, mutata mutat); in particular, two facts already stated, viz. 1. That after the morbific cause has been applied to the blood, it may depend, as we believe, on causes acting on the Nervous System only, whether or not it shall produce its specific effect; and, 2. That even after that specific effect has been produced, and the febrile actions begun, they may, in a few instances, be arrested by means (such as the cold affusion) which neither evacuate any part of the blood, nor alter its composition. But when it is distinctly understood that the change in the blood, believed to be morbific, is not in its chemical constitution simply, but in the vital qualities by which that constitution is constantly regulated and maintained, these facts have not the weight against the humoral pathology of fever, which has been ascribed to them.

At least it may be thought, that the remote cause of fever does not produce its effect by merely once impressing the Nervous System, or other living solids; but that it must necessarily affect

* [Williams' Principles of Medicine, Am. Ed., p. 283.]

for a time the fluids of the body, and perhaps multiply itself in them, in order that it may take effect on the solids. And in favour of *this form* of the humoral pathology of fever, the following facts may be stated:

1. In a great majority of the cases in which we see typhoid fever, we are sure that some peculiar matter, generally absorbed from without, must be contained in the blood; as in the case of fever from malaria, from contagion, (whether of simple fever or the eruptive fevers,) from inflamed veins, from animal poisons introduced by wounds, or from suppression of the natural excretion at the kidneys. That this peculiar matter, or the blood altered by it, should act like a ferment, assimilating much of the circulating fluid to itself, in the former case equally as in the latter, is quite in accordance with what has been observed, when purulent matter has begun to form in the blood. (See *Gulliver's Translation of Gerber*, p. 104.)

2. In all cases of idiopathic fever, as well as of the eruptive fevers, an interval, which is variable and often long, necessarily elapses between the application of the morbific cause, and the development of the fever; which is easily understood on the supposition that a change is gradually wrought on the blood during that interval, but not on the supposition of the poison acting simply on the living solids.

3. In a great majority of cases of typhoid fever, we know that a matter, similar in its effects on the human system to that which excited the disease, is ultimately evolved in large quantity from the blood, making the disease contagious; *i. e.*, the morbific poison in one way or another is multiplied in the blood of the living body.

It has been naturally supposed by pathologists at different times, that the frequent and rapid abatement of fevers after critical evacuations, is farther proof of the doctrine of their cause residing chiefly in the blood; and that this morbific cause is really carried off by these evacuations. And in support of this opinion, it has been stated, that when putrid matters, or diseased secretions, have been injected into the veins of animals, and excited febrile symptoms, a peculiarly fetid diarrhœa has preceded the recovery from these.

But when it is considered, 1. That copious or spontaneous evacuations (*e. g.*, of sweat) at the critical periods of fevers, often take place without the least good effect, if unattended by other marks of restoration of the natural condition of the capillaries; 2. That many fevers abate spontaneously and perfectly without crisis; 3. That in all contagious diseases, morbific effluvia escape for a long time from the body, without any good effect; 4. That there is no evidence of the critical evacuations possessing more contagious property than the effluvia which continually escape

without advantage; and *lastly*, that in small-pox in particular, experience has shown, that the morbific matter in the pustules may be evacuated as quickly as it appears, without benefit, and may be reabsorbed into the blood without injury—we must think it doubtful whether the critical evacuations are the *cause* of the solution of the fever that succeeds them, or whether we ought not rather to regard them as the *sign* of the restoration of the natural state of the vital actions in the capillaries of the body; whereby the excited action of the heart is enabled to throw off an unusual quantity of secretions and excretions, and then subsides; because the cause confining the circulation, and therefore stimulating the heart, has ceased to operate.

The doctrine of the existence of a morbific matter in the blood, therefore, is not established by the facts as to the critical evacuations, but must be rested on the other facts above stated.

II. Whether the morbific cause first alters the fluids or not, it is evident that it affects the actions of all the living solids, whenever it excites fever; and it may be questioned whether the first effect of the morbific cause is exerted on the living action of the nervous or of the vascular system. Besides what was formerly said on this point in treating of symptomatic fever, the following reasons may be given for thinking that the nervous system is much concerned in the changes occurring even from the commencement of fever.

1. The nervous system is evidently more affected throughout the whole series of morbid actions, than in the former case, and the first symptoms by which the idiopathic fever can in general be recognized, are strictly affections of the nervous system.

2. We have seen that when inflammation co-exists in the living body, with the effect of a violent concussion of the brain and nerves, the fever that it excites has often quite the typhoid character.

3. We have good reason to believe, that changes taking place unquestionably in the nervous system, viz., those which attend mental emotions of sufficient duration and intensity, if they have not power (as it may reasonably be conjectured that, in certain circumstances, they have) to generate fever, have at least such an influence on its causes, as to determine their efficiency or inefficacy in individual cases; which is of itself a strong presumption in favour of the belief, that the primary action of these causes is on the nervous system.

4. Besides these mental emotions, there are various other agents, formerly noticed as concurrent and accessory causes of fever, and by which we have reason to think, that the development of fever, after the poison has been imbibed, is often determined—*e. g.*, cold, muscular exertion, and intoxicating liquors;

and the chief action of all these causes also is on the nervous system.

5. There is at least one remedy of peculiar efficacy in counteracting the agency of one of the causes of fever, *i. e.*, the cinchona, which produces no visible effect on the vascular system, and the chief action of which, there is reason to believe, from what we see of it in other cases, to be on the nervous system.

But whatever be the mode in which the morbific cause, in idiopathic fever, comes to affect the circulation, it is to the direct action of this cause, and not to the influence of any local diseased actions excited in the body, that we must ascribe the enfeebled state of the circulation—the altered state of the blood—the peculiarly vitiated state of the secretions—and, in a great measure also, the deranged state of the nervous system—which were described as characteristic of idiopathic, and especially of typhoid fever.

And there is nothing inconsistent with what is known of the action of poisons, or of other agents on the animal economy, in supposing that the morbific cause, after existing some time, and perhaps multiplying itself, in the fluids, *may act simultaneously* on the constitution of the blood, on the vital affinities in the capillary vessels, on the powers of the heart, and the vital actions of the brain and nerves. Indeed, if its first action be on the vital affinities, as formerly defined, it must necessarily affect nearly simultaneously all these parts.

We have good reason to think, that it is especially by its action (whether direct or indirect) on the vital changes in the capillary vessels, that this cause excites the symptoms which were described as characteristic of fever; and we refer to the account given of fever symptomatic of inflammation, for the explanation of the manner in which the different steps in the series of changes constituting febrile action, consequent on that deficient vital action in the capillaries, are connected together.

But the peculiar depressing action of the morbific cause on all the parts of the system above mentioned, appears, from what has been said, to be perceptible throughout idiopathic, as distinguished from symptomatic fever; and it is easy to understand, that its effect on any one of these may become so intense as to be dangerous. The sedative effect on the heart is often such as to enfeeble, and sometimes such as nearly to suppress, the febrile reaction, as in congestive fever; that on the brain may produce fatal coma, as in some cases of nervous fever, independently of any effusion or organic lesion in the brain; that on the vital functions going on in the capillary vessels may be such, and so long continued, as to cause fatal inanition and exhaustion, as in some cases of fever, fatal merely by reason of the long endurance of the disease, without failure of the functions of any one organ in par-

ticular. All this is in accordance with what we see in cases where we know that the blood is morbidly altered in constitution, particularly Ischuria Renalis, or disease of the kidneys.

In most cases of fever, however, the danger is not produced solely in this way; but appears manifestly owing to a *combination* of the enfeebled state of the circulation, with peculiar derangement of the functions of individual organs, consequent on the attendant inflammations there, the symptoms and post-mortem appearances of which have been already described. In consequence of this combination, we have three distinct modes of fatal termination of fevers, which are often blended together, but in some cases are quite separate and easily distinguished; and which are clearly illustrated by the different kinds of sudden or violent death formerly described—and by what has been said above of the morbid appearances left by fatal fevers. These are, 1. The death by *coma*, referable partly to the peculiar action of the cause of fever on the brain, but partly, also, to increased determination of blood thither, or inflammatory action or effusion there; 2. The death by *asphyxia*, referable partly to the enfeebled state of the circulation, and want of power in the heart to propel the blood through the lungs, but partly also to bronchitis or pneumonia. 3. The death by mere *asthenia*, referable partly to the deleterious effect of the morbific cause on the circulation, but frequently also in part to various local inflammations, prolonging the febrile state; and especially to the inflammations and ulcerations in the mucous membrane of the intestines, which appear to have in this, as in other cases, a peculiar sedative, and what was formerly designated as a sympathetic, effect on the heart's actions.

It was already stated, that these inflammations during the state of fever, are so far influenced by the altered condition of all vital actions in the capillary vessels at that time, that the local effects which they produce differ materially from those which follow inflammation of the same parts in a system free from general fever—as is seen, *e. g.*, in watching the progress of a parotid, or other external abscess, commencing during the febrile state, but only suppurating fairly when that state has subsided. Nevertheless, the internal inflammations often attending fever are quite sufficient, when their effect is combined with the generally enfeebled state of the circulation, to cause great danger.

The nature of the connection between these local inflammations and the general fever is often obscure. In many cases, especially when the bronchiæ and lungs are affected, early in fever, they are evidently produced by a different cause, (chiefly cold applied before the onset, or during the course of the disease,) and only accidentally combined with the fever; but in other cases they may probably be regarded as effects of the general fever. The determination of blood to the head, and consequent slight inflammation

and effusion, seem often to be of this description, and are analogous to what sometimes happen in inflammatory diseases of other organs than the head. The peculiar condensation of the lowest portions of the lungs, in the later stage of fever, and its distinction from true hepatization, were already considered. The reproduction in any part of the body, of inflammatory action which has recently subsided there, appears to be an effect rather than a mere accompaniment of fever. And the peculiar inflammation of the mucous glands and membrane of the intestines, when it takes place late in the disease, may be suspected to depend very much on the bile, and other irritating contents of the intestinal canal, passing over a membrane, which, in consequence of the feeble circulation, the blunted sensation, and the deficient secretion, has lost much of its natural protecting mucus; and resting longest on that portion of the canal where we know that, from the action of the ileo-cæcal valve, there must be a delay of the feces; and to be analogous to the inflammation of other mucous membranes, consequent on section of their sensitive nerves—and to that which precedes death by starvation.

On this supposition, inflammations of the mucous membrane of the intestines, occurring towards the close of protracted fevers, will stand in nearly the same relation to them as the inflammation, ulceration, and gangrene, from pressure on external parts; which are very common, and often constitute a great part of the danger in such cases.

These relations between idiopathic fever and the concomitant local inflammations are of great practical importance; and the chief difficulty and nicety in the treatment of fever, lie in determining how far the danger depends on such local affections as demand evacuations, and how far on the effect produced on the system by the morbific cause, which will often spontaneously abate, and often demands remedies of the opposite class." (*Outlines*, &c., Am. Ed., p. 129.)]

IV. EXANTHEMATOUS OR ERUPTIVE FEVERS.

Modern nosologists restrict exanthematous fevers to certain febrile diseases accompanied with efflorescence of the skin, (comprehending small-pox, measles and scarlet fever,) and allied to each other in the following circumstances:

1. Though the eruption is of a defined character, it is preceded by a characteristic group of febrile symptoms, the fever pursues a definite course, and the exanthema passes through a regular series of changes. 2. They occur only once (with very few exceptions) during life. 3. Almost all mankind are susceptible of them. 4. They are propagated by a specific contagion.

1. The defined character of the eruption, the remarkable combination of symptoms which attends the eruption, and the precision with which the several changes or phases of each disorder occur, are most remarkable. The eruption of small-pox appears on the third day from the commencement of febrile commotion, and maturates or culminates on the tenth. In measles the fever rages in the system for four days before its specific eruption is developed, and three days suffice for the completion of its course. The efflorescence of scarlatina is perceptible on the second day, and begins to disappear on the fifth from the first occurrence or rigour of sickness. The course of the fever and the series of changes which the eruption undergoes are alike fixed and uniform, being in all important points uninfluenced by age, climate, season, or habit of body, and admitting only certain modifications from causes altogether unknown or imperfectly understood.

2. The second common character of the true exanthemata is founded on the law of non-recurrence. Immunity from second attacks of the same malady is a very remarkable principle in pathology. Mankind have by common consent attributed the power of conferring immunity from second attacks to three only of the many diseases to which we are liable—viz., to small-pox, measles, and hooping-cough. It constitutes undoubtedly a most important feature in the medical history of these disorders, and by virtue of it they are, to a certain extent, isolated from other maladies. The same property belongs, though in unequal degrees, to three other forms of febrile disease—viz., to yellow fever, to the plague, and to scarlet fever. It is more striking in yellow fever than in plague; more observable in the plague than in scarlet fever; but in all, the susceptibility to future attacks is either greatly lessened, or entirely removed, by once undergoing the disease. The doctrine of immunity from second attacks, though generally predicable of small-pox and measles, is, even in those diseases, liable to certain exceptions, as will be more fully explained afterwards.

3. Universal susceptibility is the third character of the exanthemata. The exceptions to this law, in the instances of small-pox and measles, are very few, and there is great reason to believe, that in many of these excepted cases, the inaptitude to receive the disease arises from temporary causes; and ceases in the course of a few months, or possibly not until after the lapse of years. The principle is not of such general application in the case of scarlatina.

4. The exanthematous fevers are propagated by contagion. The power of producing a contagious matter is one of the most striking characters of small-pox, and in the phenomena of inoculation we possess the most convincing proof of the truth of the

principle. The evidence in favour of the possibility of inoculating, or rather of artificially exciting, the measles is strong, though still open to some objections. The instances of the spreading of scarlet fever by personal intercourse are so numerous and unequivocal, that no enlightened pathologist of the present day hesitates to acknowledge the fact. Some contagions develop themselves quickly, such as those of scarlet fever and plague, which generally require from four to six days for their incubation; sometimes, however, more especially in scarlet fever, the period has been longer deferred. Others, as small-pox and measles, require nearly a fortnight for their perfect development. Some contagions, however, remain latent in the constitution for three, four or six weeks, but each of these respective periods is subject to certain modifications, which will hereafter become objects of special investigation.

[V. CLASSIFICATION OF FEVERS.

The simplest arrangement, and perhaps the best for practical purposes, is that founded on the peculiar phenomena which are constantly presented by the different forms of fever, constituting the types. In one variety, we have the febrile phenomena interrupted absolutely or incompletely at certain periods; whilst in another, the train of phenomena proceeds in an uninterrupted series; and a third is accompanied with a peculiar and characteristic eruption. The order that we shall observe, therefore, will be:

I. Continued Fevers.

II. Periodical Fevers.

III. Exanthematous or Eruptive Fevers.]

CHAPTER II.

CONTINUED FEVER.

Continued Fever may be defined nearly in the same terms with those formerly employed in the definition of fevers generally. It is *a disease in which, after a precursory stage of languor, weakness, and defective appetite, acceleration of the pulse takes place, with increased heat, great debility of the limbs, and disturbance of most of the functions, without primary local disorder, and without well-marked remissions.* It has been already stated above, that none of these characters is absolutely invariable. Thus the appetite is occasionally not at first affected; the strength is at times so little reduced in the early days, that a man in the incipient stage has been known to walk forty-five miles within as many hours; the pulse not unfrequently does not rise beyond seventy; the heat is often immaterially increased; the debility of the advanced stage may disappear for a time in connection with active delirium: local inflammations frequently concur with the general fever especially when fully formed; and very distinct remissions are often enough observed towards the commencement, and sometimes throughout the whole course of the fever. The least invariable character is disturbance of the functions generally; for it seldom happens that the functions of the digestive organs and of the skin are not essentially deranged, and the clearness and precision of the external senses impaired.

I. SYMPTOMS OF CONTINUED FEVER.

There is but one way of taking a comprehensive and simple view of the symptomatology of continued fever; which is, by considering first the essential phenomena of its three leading varieties or types, and then the phenomena which are incidental or accessory. It seems advisable, too, that the symptoms of the three types be viewed in succession or close relation to each other; because they are, at least in the opinion and according to the experience of the writer, mere varieties of one fundamental disease, originating in the same causes, and constituted merely by differences in those obscure co-operating influences which are alluded to when we speak of epidemic constitution. This is the

conclusion to which every one will arrive, who has had an opportunity of closely watching in hospital practice a long series of epidemics, similar to those which have ravaged the city of Edinburgh between the years 1817 and the present time. For the disease has been clearly seen, during that interval, to pass very gradually from a type in which pure inflammatory fever was exceedingly common, first into one composed of the same fever in the early stage, and of adynamic fever in the advanced stage, and at length into a type of nearly pure adynamia or typhus, which has prevailed for a few years past. And these changes have thus gradually taken place, without any other essential alteration in the history of the disease, but especially without any change in its apparent mode of propagation and causes.

[A. EPHEMERAL FEVER.

Syn. *Diary Fever. Febricula, Ephemera, Febris diaria. Simple Fever*, of Fordyce. *Eintägige Fieber*, Germ. *Fièvre Ephémère*, Fr. *Effimero*, Ital. *Efemera*, Span.

Ephemeral Fever is characterized, according to Dr. Copland, *by increased frequency and strength of pulse, with heat of skin, headache, thirst, and white excited tongue; terminating in perspiration generally within twenty-four hours.*

It is a frequent disease in this country, and is the slightest as well as simplest of all primary febrile disorders, and is so named from its seldom lasting longer than a single diurnal revolution.

Causes.—It is often difficult to discover any unequivocal cause for an attack of ephemeral fever. It affects chiefly children and young persons, and frequently seems to be excited by the atmospheric vicissitudes during the irregular weather of the spring months in temperate climates. Excessive muscular and mental exertion, from prolonged exercise, or intense study; exposure to sun; the intemperate use of alcoholic drinks; disorder of the digestive organs, from repletion, or the nature of the ingesta, or congestion of the liver, or a vitiated condition of the secretions of the primæ viæ, are all capable of producing an attack. The febrile condition, often excited in puerperal women on the first secretion of milk, has, by most writers, been classed under this head.

Symptoms.—In the acuter form of ephemeral fever the invasion is generally sudden, the attack commencing with a chill; but in mild cases there are lassitude, yawnings, general malaise, with a feeling of irritation, or excitement. These symptoms, or the initial chill when occurring, are soon succeeded by heat of skin,

and cephalalgia. The face is flushed, and animated, but the expression is natural; the pulse is frequent, strong, and full; there is frequently pain in the small of the back, with a sense of great weariness and soreness in the limbs; the thirst is intense; there is no appetite; the tongue is white; the papillæ enlarged; the mouth is dry, with a bad taste; and the urine scanty and high coloured. The skin, though hot, is usually soft. In children, and in some women, when the attack is severe, slight delirium may supervene for a short time. Exploration of the chest and abdomen discovers no lesion of the contained organs. These symptoms, with restlessness, languor, want of sleep, and general uneasiness, having lasted for six, twelve or eighteen hours, the fever begins to diminish; the skin becomes moist; the urine more copious, and depositing a sediment, and the free perspiration occurring, the attack subsides within twenty-four hours, though occasionally it continues for several days, assuming the characters and type of *Inflammatory fever*. Sometimes the patient continues listless and feverish on the following day; does not feel disposed to quit his bed; and passes an uncomfortable day, with slight febrile exacerbation towards evening. After a good night's rest, however, he usually awakens refreshed, and well.

Diagnosis.—It is often extremely difficult to decide, at the outset of an attack, whether it is a case of ephemeral, periodic, or continued fever. The absence or presence of the causes just enumerated, may assist our inquiry. Whilst the non-occurrence or insignificance of the initial chill, and the continuation of the fever beyond six or eight hours will often enable one to distinguish it from intermittent fever; the amount of vascular excitement, the slight depression of the nervous powers, and the very transient duration of the premonitory symptoms will serve to distinguish it from the more serious varieties of fever.

Prognosis.—The prognosis is of course favourable; but it should be borne in mind that sometimes the disorder is prolonged beyond the diurnal period, and assumes the characters of *Synocha.*

Treatment.—Confinement to bed, abstinence from food, and demulcent drinks are often all that is necessary for an attack of ephemeral fever, whose tendency is towards a favourable termination, and which, indeed, requires little or no treatment. If, however, the disorder has followed exposure to a hot sun, and there is much vascular excitement, with cerebral symptoms, blood-letting may be advisable, together with active purging, and cold applications to the head. If the attack be subsequent to a debauch, the stomach and bowels should be freely evacuated. Where the stomach is irritable, small doses of the nitrate of potash

in combination with the muriate of ammonia may be administered.—

℞.—Potassæ nitratis gr. xx.
Ammoniæ hydrochlor. gr. xij.
Aquæ camphoræ ʒvj.
Aquæ ʒx.
M.
Sig. To be repeated every four hours.

When the skin is dry and unperspirable, diaphoretics should be administered.

℞.—Suc. limon. recent. ʒiij.
Potassæ bicarb. q. s. ad sat.
Spr. æther. nit. ʒij.
Syr. simp., ʒi.
Aquæ ʒiij.
M.
Sig.—A tablespoonful every two hours.

Cold, or even iced drinks may be freely allowed, when wished for, together with small quantities of soda water.]

B. SYNOCHA, [OR INFLAMMATORY FEVER.

Syn. Καῦσος, Hippocrates; *Synochus Imputris*, Galen; *Febris Sanguinea*, Avicenna; *Synocha Biliosa, F. Sanguinea*, Leunert; *Fièvre ardente*, Quarin; *F. Septinaria*, Plater; *F. Continua Inflammatoria*, J. P. Frank; *Fièvre angioténique*, Pinel; *Fièvre Inflammatoire*, Fr.; *Synoshische, Entzündliche Fieber*, Germ; *Febbre Inflammatoria*, Ital.]

It has become fashionable of late with medical authors to doubt or deny the existence of such a fever as synocha or inflammatory fever, or at least to limit it to warm climates, and to admit ephemeral fever alone as an exemplification of it in temperate countries. But this is a mistake, arising simply from limited opportunities of observation, and the disregard of epidemic differences occurring in different years and different places. In the Edinburgh epidemic of 1817–20, a fever purely inflammatory, or with complications, but altogether divested of the typhoid character, was so prevalent, that from a numerical statement kept for some time by the writer, it formed between a fifth and a sixth of the patients in the infirmary and fever hospital. In the subsequent epidemic of 1826–9 the same form was observed, but by no means in so great a proportion; and since then it has gradually disappeared, and is now scarcely ever met with. There is no room, therefore, for the doubts which have been lately thrown over the accuracy of Dr. Cullen's classification and delineation of fevers, from the apparent impossibility of finding his synocha or inflammatory fever. In this, as in other respects, Cullen's delineations are true to nature, whatever may be thought of his speculations in regard to the proximate cause or essence of fever; and, indeed, little has been hitherto done

to improve the leading features of his classification, and least of all by those who have slighted his admirable descriptions of disease.

Synocha may be defined nearly in the language of Cullen, *a fever consisting of a state of chilliness or rigor, succeeded by great increase of heat, frequent hard pulse, redness of the urine, little disturbance of the mental faculties, and tending in general to terminate by sweating.*

Symptoms.—It commences for the most part abruptly. The patient is suddenly seized with an undefinable sense of feebleness, languor, and oppression, disinclination for food, sickness, and perhaps also vomiting, frequency and feebleness of the pulse —followed speedily by pain in the back, headache, a peculiar sense of weight or rending in the limbs, coldness in the back, general chilliness, and often absolute shivering, with paleness of the features, and the *cutis ancerina.* When these symptoms have lasted for a period varying in general from one hour to half a day, the coldness passes off; the pulse, from being soft and fluctuating, becomes hard, sometimes full and bounding, often small, wiry and incompressible, generally very rapid, sometimes so frequent as 140, 150, or even 160; the tongue dry and covered with white or yellowish fur; the skin parched, red hot, often pungently so; the animal temperature elevated to 102°, 104°, and occasionally so high as 107°. At the same time there is increased headache, with giddiness, throbbing of the temples, and flushing of the features; great undefinable uneasiness in the limbs, occasioning frequent change of posture; an intense sensation of heat; whiteness and dryness of the tongue, with urgent thirst and desire for cold liquids, but a total loss of appetite; constipation; redness and scantiness of the urine, often with a tendency to discharge it frequently; extreme irritability of the senses of sight and hearing, more especially remarked in the irritable constitutions of persons in the better ranks, so that in them the faintest light, and any regularly recurring sound are insupportable. An exacerbation commonly occurs in the evening or early part of the night, and a remission early in the forenoon, but the difference is frequently trifling. The fever is thus fully formed in general in the course of the first evening; but not unfrequently the hot stage is completely developed in an hour or less; and on the other hand, it may be imperfectly presented till the second day. There is not necessarily any local pain, except headache and a sense of soreness or rending of the back and limbs. Vomiting and sickness are seldom present, or at least troublesome, till the second or third day; are often wanting throughout most of the attack; and frequently are insignificant till blood-letting has been prac-

tised, after which vomiting is often frequent and severe. The faculties of the mind are for some days unaffected, except by restlessness and anxiety, and they may continue undisturbed even during the whole course of the fever; but frequently after a few days there is a tendency to delirium, and at times the delirium is active, and indicated by frequent incoherent talking, together with a disposition to roam. Very often, however, the tendency of the patient to leave his bed, from mere febrile restlessness and desire of change of posture, is mistaken for delirium. Delirium occurs most frequently for a short time before the hot stage of the fever is about to be resolved. The blood from a vein is commonly very florid—sometimes, in young adults with high reaction, so unusually bright, that the surgeon is apt to imagine he has opened an artery instead of a vein. It coagulates in general firmly, with little separation of serum; but not unfrequently shows the buffy coat, contracted clot, and distinct separation of serum observed in acute local inflammations.

[Andral and Gavarret have carefully analyzed the blood in this disease, and give the following account of their researches.

They made nine analyses of the blood of six persons. The fibrin did not exceed the normal amount in any instance, (in one, however, it amounted to 3·2;) in three cases it was a little below the standard, but exceeded 2; in two cases it was rather less than 2; and in one case as low as 1·6. The amount of blood-corpuscles was lower in only two cases than in normal blood; in the others it was more or less increased, and in the blood in which the fibrin amounted to only 1·6, the corpuscles amounted to 157·7, which if the fibrin were estimated at 3, would give the enormous amount of 296. We have only one instance in typhoid blood of so high a proportion. The amount of the residue of the serum is increased, rather than diminished, and the same is the case with the solid constituents of the blood generally.

Their analyses gave the following results:

Venesection.		Date of the disease.	Water.	Solid residue.	Fibrin.	Blood-corpuscles.	Residue of serum.
1st Case	1	7	766·2	233·8	3·0	143·5	87·3
2d "	1	8	769·5	230·5	1·8	136·4	92·3
3d "	1	8	761·3	238·7	2·9	142·7	93·1
4th "	1	15	770·8	229·2	3·2	137·9	88·1
5th Case	1		785·6	213·4	2·3	125·4	86·7
	2		788·3	211·7	2·2	124·0	85·5
	3		790·8	209·2	2·1	123·0	85·5
6th Case	1		744·2	255·8	1·6	157·7	96·5
	2		779·7	220·3	2·1	129·3	88·9

The inorganic constituents of the residue of the serum amounted on an average to 7·5%, which corresponds with the proportion in typhoid fever.

Jennings* has analyzed the blood of a girl aged 14 years, suffering from continued fever. He found it composed of:

Water - - - -	856·0
Solid residue - - -	144·0
Fibrin - - - -	2·0
Fat - - - -	3·0
Albumen - - -	37·0
Blood-corpuscles - -	91·0
Extractive matter - -	3·0
Alkaline salts - -	3·8
Earthy salts - - -	1·0

Becquerel and Rodier have analyzed the blood of 3 men and 2 women, suffering from ordinary continued fever. The mean composition of the blood of the 3 men is given in the following table:

Density of defibrinated blood - - -	1056·8
Density of serum - - - - -	1025·5
Water - - - - - -	781·6
Solid constituents - - - - -	218·4
Fibrin - - - - - -	2·8
Fat - - - - - -	1·7
Albumen - - - - - -	65·7
Blood-corpuscles - - - - -	142·4
Extractive matters and salts - - -	5·8

Here we see that the fibrin and albumen remain nearly normal, while the corpuscles, instead of diminishing, are slightly above the average (their numbers being 146, 142, and 138). The fatty matters and salts offered no peculiarity.

They give the following particulars regarding the blood of the two female patients.

The corpuscles were augmented (135·5) in the first case; normal (125·5) in the second: fibrin normal (1·9) in the first; doubled (3·6) in the second: albumen normal (73 and 70) in both. The serum was turbid in both cases. In the case in which the corpuscles were 125, the clot was firm and resisting, in the other it was soft and diffluent.

Andral and Gavarret also made 21 analyses of the blood of 11 persons labouring under continued fever.

They divide their analyses into two series; one containing the results obtained when the blood was taken nearly at the termination of the disease; the other when certain inflammatory states, as angina, erysipelas, bronchitis, &c., had supervened. These researches exhibit less of the characters of hypinosis than those instituted on the blood at the commencement of continued fever, which, in the first series, may be due to the circumstance of the disease being on the decline; and in the second, to the inflamma-

* [Course of Lectures on the Physiology and Pathology of the Blood, by H. Ancell. The Lancet, 1840, p. 339.]

tory complication. In both series the fibrin exceeds the normal amount, and in both, the amount of corpuscles is, in part also below the standard.]

The *terminations* of this form of fever, are essentially three in number, abrupt departure in connection with some critical discharge, gradual mitigation and disappearance, without particular increase of any of the excretions or any adventitious evacuation, and gradual transition from the purely inflammatory character into the typhoid type. But when the last of these courses is pursued, the disease ceases to be synocha, and is characterized as synochus. A common course is gradual mitigation of the symptoms between the seventh and fourteenth days, sometimes without any critical discharge, yet sometimes too in concurrence with occasional attacks of sweating. If the fever lasts, however, much longer than seven days, it commonly puts on, sooner or later, the typhoid or adynamic character. If, on the contrary, there is decided amelioration earlier than the seventh, or even on the seventh day itself, the amendment usually becomes complete, and occurs in connection, either with a profuse attack of sweating, or sometimes, though far more rarely, with an attack of diarrhœa or of epistaxis. The most frequent, and by much the most remarkable, variety of this type of fever, is that which terminates abruptly by sweating. Sometimes so early as the fourth day, very rarely earlier; most generally on the fifth or sixth, sometimes on the seventh or eighth, but seldom at a later period, the skin becomes moist, along with sudden abatement of the headache and jactitation; and a profuse discharge of sweat follows, which lasts for two, three, four, six hours, or upwards, and leaves the patient languid and exhausted, but otherwise almost free of every complaint, and, in particular, with the pulse at the natural standard. It is not uncommon to observe a sweat of four hours change the condition of a patient from all the tortures of an ardent fever, with the pulse at 140, to a state of complete repose and absence from all suffering except from extreme languor, with the pulse at 70. In a few rare cases the fever is carried off in like manner by critical diarrhœa or critical epistaxis.

[A critical hemorrhage is not an uncommon termination of this disease. In young persons epistaxis is most frequent; in adults a hemorrhoidal flux; whilst in females, the sanguine discharge takes place from the genital organs.]

Convalescence from an attack of fever of this kind is always slow, several weeks being requisite for restoration of the strength, even where the patient has not been more than five or six days under the proper febrile symptoms. Relapse too is common, and it usually takes place about the fourteenth day; nor does any care on the part of the patient to avoid the causes of ex-

citement or fatigue, seem to have any tendency to diminish the chance of relapse. This commences, for the most part, with severe shivering; symptoms succeed similar to those already mentioned as characterizing the primary attack; and the disease is finally resolved by another fit of profuse perspiration, generally in the course of the third day from the reappearance of rigors.

Such is a sketch of inflammatory fever in its pure state, as it occurred in a considerable proportion of cases of epidemic fever, especially among young adults, both in Edinburgh and in other parts of Great Britain and in Ireland, between the years 1817–20, and likewise, though to a less extent, in the succeeding epidemic of 1826–9. In many instances, however, the disease was not altogether pure. More generally it was attended, in one part or another of its course, with symptoms of local inflammation—most frequently in the chest, occasionally in the peritoneum, more rarely in the larynx, often in the tonsils, seldom in the parotid gland, and very seldom in the head. Such local affections, of which catarrh, pneumonia, and pleurisy, were the most common, did not show themselves till the fever had lasted for a few days; they frequently disappeared some time before the cessation of the febrile symptoms; and they were, for the most part, very easily removed by general or even local depletion. In a few rare cases the local inflammation went on where the fever was checked. Rheumatic attacks were common during convalescence; but they were seldom attended with any febrile disturbance of the circulation. Cases of pure fever were most frequent in young persons of the better ranks, who were not exposed to the ordinary co-operating causes of local inflammation.

[When a case of inflammatory fever extends beyond four or five days, there is a probability of the existence of some latent inflammation, consecutively developed. It is of great importance that the internal organs should be carefully explored from day to day; for, whilst simple continued fever may last for several days without implicating any viscus, it should be borne in mind that the liability to visceral phlegmasiæ is in proportion to its duration.]

Diagnosis.—Synocha may pass by insensible shades, first, into synochus; secondly, into gastric or gastro-intestinal fever; and, thirdly, into the acute or febrile inflammations. It is seldom difficult to distinguish idiopathic local inflammations from primary inflammatory fever; yet sometimes the diagnosis is obscure. The chief distinctions are, that in the latter the local inflammation is slight compared with the general febrile state; that it arises consecutively to the fever, and may cease without the latter disappearing or even abating; and that there is throughout the disease, but especially at the beginning, more oppression, nervous exhaustion,

and restlessness, together with a peculiar expression of the countenance, which a practised person may for the most part readily recognize. Gastric fever is sometimes distinguished from synocha with great difficulty. The pyrexia, however, is seldom so violent, nor the countenance so oppressed, nor the sense of rending and restlessness of the limbs so distressing; neither is there so marked a tendency to resolution of the disease by sweating; while, on the other hand, the tongue is more loaded with yellow sordes, or red and raw-looking—the local symptoms referable to the abdomen are generally more marked, though this is far from being invariably the fact—and there is usually a much more distinct tendency in the fever to put on the remittent type. There is never any difficulty in distinguishing true inflammatory fever from synochus; but the former passes insensibly into the latter, by the supervention of typhoid symptoms towards the commencement or termination of the second week; and, according to the degree of that secondary stage, the case may be regarded as belonging either to one type or the other.

[To establish a differential diagnosis it is first necessary to ascertain whether the febrile movement is essential, or dependent on some local phlegmasia. Simple inflammatory fever is distinguished from the fever preceding the eruption of variola, measles, or scarlatina by the special character of the prodromes, to be hereafter indicated, as well as that of the fever. It is by no means unfrequently confounded with typhoid fever assuming, at the commencement, the inflammatory type. When treating of this latter affection, the differential signs will be pointed out.

Prognosis.—The prognosis in simple inflammatory fever, of temperate climates, is always favourable, except when complicated with inflammation of some important viscus.

Causes.—Inflammatory fever commonly attacks young, vigorous and plethoric persons, who lead a sedentary and luxurious life. An attack is often sudden; following a debauch, bodily or mental exertion, or the suppression of an habitual sanguine discharge. It sometimes occurs epidemically, especially in dry or elevated situations, and during the spring of the year.

Treatment.—A slight attack of inflammatory fever requires but little treatment. Confinement to bed, an antiphlogistic regimen, cold acidulated drinks, with an occasional saline purge are all that is indicated. If there is high vascular action, blood-letting should be early resorted to, and the first bleeding ought to be sufficient to make a decided impression. If the patient complain of severe and continued cephalalgia, local bleeding, by leeches or cups, with the application of cold to the head, and stimulating

pediluvia may be employed. If the attack is consequent to a suppressed hemorrhage, an effort should be made to recall the sanguine discharge. Consecutive local inflammations should be early and actively treated.]

The Synocha of hot climates seems not to differ essentially from the disease here described. The tendency to diaphoretic crisis, however, is less marked; there is not the same frequency of relapse; neither is it observed that relapse is apt to occur after a fixed interval, rather than at other irregular periods of convalescence. It is also said by Dr. Stevens, that it is never ushered in by rigors, and that the blood, though always unusually florid, never presents the buffy coat of inflammation. Farther, while the inflammatory fever of hot climates evidently arises from atmospherical vicissitudes, or such other causes, and independently of communication with the sick, the synocha which is described above often originates as unequivocally in infection, as will be more fully explained under the head of the *Causes of Fever.*

[This variety of Inflammatory Fever differs from the foregoing, or mild form, only in degree. The disease has been described by the names of *Synochus Causonides*, by Gilbert; of *Synocha Causodes*, by Manget; of *Synocha Ardens*, by Sauvages; of *Endemial Causus*, by Mosely; of *Inflammatory Endemic*, by Dickenson; and is very generally known in warm climates, as the *Climate* or *Seasoning Fever.* It may be said to be *endemic* in hot countries, in dry seasons and localities, and attacks strangers who visit them from the north. It has been confounded with both the *Marsh* or *Remittent Fevers*, and with the epidemic *Yellow Fever.* It attacks, as has been stated, those recently arrived, and more especially the young, the robust, the plethoric, the intemperate, and those exposed to the sun, and to the night air. It is not produced, Dr. Stevens asserts, by marsh poison, or contagion, but by long-continued, excessive heat, acting under peculiar circumstances, on the bodies of unseasoned strangers lately arrived from northern countries. "That the Climate Fever," says Dr. S., "is not produced by the marsh poison, is evident, not merely from the symptoms, but also from the fact that it is generally met with in hot and dry situations, such as the central part of the town of St. Thomas, where the marsh fever is not known as an endemic."* Those who have had the *Climate Fever* are not susceptible of it a second time, unless they leave their own residence, and return to it after a prolonged sojourn in a northern climate. According to the same authority, it only occurs as an epidemic during the hot months, when the thermometer is upwards of 88° during the day,

* [Observations on the Healthy and Diseased Properties of the Blood, 1832.]

and at least 80° during the night. It was prevalent, during the wars of the French Revolution, among the British troops and seamen in the Mediterranean. The causes producing the disorder rarely affect the older residents, and never the natives of the country, or the blacks; women and children, the aged and feeble, are much less liable to be attacked than the robust and plethoric. Dr. Copland, who had extensive opportunities of seeing this disease in 1817, thus describes it:—"The aggravated form of inflammatory fever is seldom preceded by very marked premonitory symptoms. The attack is usually sudden. Giddiness, faintness, and general uneasiness, sometimes, however, precede it for ten or twelve hours. There is occasionally a slight and brief chilliness at the commencement, especially in the less violent cases, rapidly followed by a sense of universal heat; by flushed face, frontal headache, and vertigo; by inflamed, heavy eyes, and great sensibility to light and sound; by pain in the occiput, neck, back and limbs; and by a strong, full, hard, and accelerated pulse. A sense of heat, oppression, pain, or anxiety is felt at the præcordia, sometimes with a dry cough, and pain in the side; respiration is quick, laborious, suspirious, or anxious; the tongue is white, excited, and its edges red; the fauces are arid, thirst urgent, and skin hot and dry; the urine is scanty, the bowels costive; and there is generally nausea, but seldom vomiting until some time after the attack. If the disease be not mitigated by treatment, the patient becomes extremely restless, the headache is rending and intense, vascular action is excessive, and the heat very great. Vomiting now supervenes, and follows the ingestion of whatever is taken to allay the urgency of thirst. The matters thrown off are generally tinged with bile, and a bilious yellow suffusion of the skin is frequently observed. Bilious vomiting and purging occasionally occur with the yellowness of the surface, and, in the slighter cases, become a favourable crisis. There is often great drowsiness, but no refreshing sleep. These symptoms of excessive excitement proceed with various degrees of violence, and occupy a period of from twenty-four to sixty hours, but most commonly from twenty-four to forty-eight hours. During this period blood taken from a vein is remarkably florid, warm, and fluid. The fibrin coagulates firmly, but the crassamentum is without crust, and is rarely cupped. The excitement, having reached its acme, is quickly followed by exhaustion. This is indicated by a subsidence of the most urgent symptoms: the pain and heat are lessened; the skin becomes damp or clammy; and the patient has a sense of cold or slight chilliness. This delusive remission is a state of great danger; in some cases, it passes into rapid sinking—into a speedily fatal collapse; but, more generally, irregular determinations of blood, or indications of especial lesion of particular parts, are evinced before death ensues. With the

diminution of heat and pain, the pulse falls; the countenance becomes anxious and distressed; the eyes sunk, the pupil dilated; vomiting continues without intermission, especially if the cerebral affection has abated; sometimes delirium is present, at others there is great insensibility or tendency to coma, and in these cases the stomach is more tranquil. *Discoloration* of the skin generally takes place in this stage, appearing in yellow, yellowish brown, and livid patches. It never occurs in the period of excitement, for it is quite dissimilar from the bilious yellowness occasionally observed in that period. It is commonly attended by passive hemorrhage from the nose, gums, eyes, ears, &c., and by black and grumous vomiting. The change of colour and hemorrhage proceed from exhaustion of the vital influence in the extreme vessels, and from the changes induced in the mass of blood. The matters thrown off the stomach consist at first of ingesta and serous fluid, often coloured by bile. In a more advanced stage they are ropy, mixed with numerous small shreds, flocculi, or films, which soon acquire a dark brown, purple, or black colour; but do not, at first, communicate much of the same tint to the fluid containing them. Afterward, the matters vomited are more intimately mixed; and, from dark-coloured blood which has been effused into the stomach, vitiated bile, and other morbid secretions, assume a dark or coffee-grounds appearance. At the same time, dark-coloured matter, resembling tar mixed with black blood, is freely discharged from the bowels. The other symptoms characterizing this stage, and preceding dissolution, are, soft, quick, intermitting, or irregular pulse; clammy, cold, or partial sweats; deep and heavy respiration; coldness of the extremities; black urine, or suppression of urine; singultus, convulsive sighs; tremors and subsultus tendinum; faltering speech; low muttering or raving delirium; strugglings to get up in bed; dark or raw appearance of the tongue; livid blotches over the body, particularly the præcordia; faintings or coma, and glazed eyes. The *blood* at this period is black, thin, and dissolved, its fibrin seems diminished, and it does not separate into crassamentum or serum; or if it does, the former consists of a thin, dark jelly, with the black colouring matter precipitated towards the bottom of the vessel."—(*Dict. Pract. Med.*, Am. Ed.)

The chief complications are gastric and biliary disorders.

In 1843–44 a remarkable epidemic continued fever prevailed in Scotland and parts of England, and was regarded by many of the distinguished physicians who had an opportunity of observing it as a fever of a different and distinct *species* from the common *typhus* of Great Britain. The description of *Synocha* just given by Dr. Christison, principally taken from the epidemics of 1817–20 and 1826–29 in Edinburgh, leaves little doubt that these epi-

demics were identical. Dr. Cormack* describes two forms of the disease—the moderately and the highly congestive. "The symptoms of invasion are in all cases remarkably similar, both as to their nature, and order of occurrence. The patient is first seized with coldness, rigors, headache, pain in the back, and more or less prostration of strength; but the latter symptom, it must be remarked, is often not at all urgent, many walking long distances from the country to the hospital, especially during the first days of the disease; and a still greater number of the destitute town patients lounge about the streets after their seizure, and come into us on their legs. After a period varying from less than half an hour to several hours, the cold fit terminates, when the severity of the headache greatly increases, and a dry burning heat comes over the whole body, accompanied by much thirst and general uneasiness. The hot stage is succeeded by a sweat, usually very profuse, continuing for a number of hours, and seldom attended or followed by any relief to the headache or other pains. Sometimes, though rarely, there is no sweating for two or three days after the seizure. Occasionally, also, there is no well-marked hot stage between the cold and the sweating fits; and in at least a few cases, the sweat breaks out on the face and upper part of the body, whilst the patient is yet in his initiatory rigors. It is proper to remark, that during the whole course of the disorder, the perspiration has a characteristic disagreeable smell, and is decidedly acid, as is proved by its reddening litmus paper, and that sometimes with intensity. During the three stages of the initiatory paroxysm the pulse is rapid, being sometimes as high as 150, seldom below 90, and commonly ranging between 90 and 120. During the rigors, in several cases, I have found it very wiry and tremulous; in the hot stage it is often hard, and not very easily compressed; at the sweating period, it becomes fuller and softer, and does not exhibit that deficiency in strength, shown after, and during the perspirations of a more advanced period of the fever. For the first forty-eight hours, the tongue commonly continues moist, exhibiting at the same time a white or brownish yellow fur, excepting at the point, where there is usually a clear space, extending over a space, often (as in *typhus abdominalis*) shaped like a triangle, the extremity of the tongue forming the base. Afterwards, the tongue becomes dry, and longitudinally streaked on the centre with brown, in which state it continues till the approach or arrival of the crisis, at from the third to the ninth, but in the majority of cases, on the fifth day. During the first four days, some of the patients have occasional short rigors; but most commonly, they are in a state of dry ardent fever, with occasional sweatings. These sweatings

* [Natural History, Pathology, and Treatment of the Epidemic Fever at present prevailing in Edinburgh and other towns, by John Rose Cormack, M.D. Edinburgh, 1843.]

occur, or at all events, commence in most cases, between two and nine, A. M; but to this rule, there are many exceptions. In a considerable proportion, even of the ordinary and mild cases, nausea and vomiting usher in and attend the sufferings of the first days. Pain at the scrobiculus cordis generally accompanies these symptoms; not unfrequently, it is present without them. A symptom which uniformly occurs during the first four days, is severe muscular and articular pain. General uneasiness, or pain in the abdomen, (but particularly above the pubes, and over the liver and spleen, when pressure is made on these regions,) are very commonly, but by no means uniformly met with. So long as the patients suffer much from the symptoms now described, they sleep badly, and frequently not at all, unless opiates are administered. The severe pains in the joints and muscles are often sufficient to account for the bad nights complained of; but even with those who do not suffer much from this cause, sleeplessness is a distressing symptom up to the crisis. A remission on the third day is very common. It occurred in all the cases which I have had an opportunity of attentively observing from the invasion onwards. On or about the fifth day, there is an evident manifestation of the violence of the disorder heing expended; and this change for the better is often very sudden and complete. One day, we hear the patient moaning and groaning in pain; and on the next, he is at ease and cheerful, his only complaints being of hunger and weakness. This state is generally ushered in by a copious sweat; or by epistaxis or diarrhœa. The sweating was by far the most common critical evacuation till the beginning of October, when diarrhœa and dysentery, formerly rare occurrences, became common; and at the present time (October 30) they are as usual as sweating. After this change, the pulse, tongue, and skin are quite natural; and the facial bronzing often becomes much less striking. For several days, or till about the fourteenth or fifteenth day of the disease, there is a period of intermission, during which a great deal of lost strength is regained, and a steady improvement goes on in all respects. On, or about the fourteenth or fifteenth day from the beginning of the disease, the patient relapses; or, in other words, has a paroxysm of fever, similar to that which began his first attack. The relapse takes place late or early, just according to the date of the first convalescence, as will be clearly seen from all the cases to be detailed. It sometimes happens, that the onset and progress of the second attack are attended by severer, and at other times, by milder symptoms than those of the first. In the relapse, the abortions most commonly take place. In it also, the muscular and articular pains are very often most severe. Cases, which in the first attack were strictly mild and ordinary, have in the second, become signalized by jaundice, delirium, diarrhœa, dysentery, and other grave symptoms. Such occurrences are,

however, not common. A large number of patients have a second and generally mild relapse, on or about the 21st day. As these relapses take place often after dismissal from the hospital, it was some time before I discovered the frequency of third attacks. In those who are young and of good constitution, the convalescence is rapid and complete. In the old and debilitated, it is otherwise.

One of the most common symptoms in the highly congestive form of the disease, is yellowness of the conjunctiva, and of the whole surface of the body. It generally appears between the third and seventh day, and is always most intense on the face, neck, chest, abdomen, and thighs. The hue of the neck and chest is the most vivid; then comes, of equal, or nearly equal brightness, the abdomen; then, somewhat fainter, the thighs; then, considerably paler still, the legs, arms, and forearms; the hands and feet get their colour later, always to a much less extent, and sometimes not at all. The yellowness occasionally appears during the relapse, and not in the first attack. I have seen it present in both. Associated with the yellowness, there are generally depression, less or more delirium, dusky, and often porter-coloured urine, black melæna-like stools, and hemorrhages from some of the mucous membranes. In the worst of the cases, black coffee-ground like matter is ejected from the stomach, and passed per anum. In some cases, the black vomit occurs without the yellowness; and, on the other hand, at the autopsy of yellow patients who have had no black vomit, this matter has been found in the stomach, and other parts of the alimentary canal. Enlarged liver and spleen, and tender and tympanitic abdomen are less constant, but still very usual symptoms in cases characterized by yellowness or extreme congestion. Difficult micturition has been complained of by several of my yellow and purple patients. With the exception of the purple countenance, the symptoms which usher in the congestive form of the disease, differ little from those attending the disorder in its milder degree. As has already been remarked, there is some considerable difference in the cases as to the time at which the yellowness appears. Generally, in the severe cases, there is merely a remission about the seventh day, but no intermission; and even in those who died a few days later, a slight amendment was noticed about the usually critical period."

The bronzing, leadening, or purpling of the countenance before and after seizure,—which Dr. C. states as a peculiarity which struck all the visitors to his ward,—seems to have escaped the notice of other writers on the subject. It reminded some of the aspect of the inhabitants of the marshy districts of Italy, others saw a resemblance in it to the sufferers from the Walcheren expedition, and others of the remittents and intermittents of Canada, the West Indies and Italy; it coincided, Dr. C. adds, with the descriptions

given by Audouard and others of the dingy, flushing, or leaden hue, which heralded the appearance of jaundice in cases of yellow fever. Dr. Arnott, of the Dundee Infirmary, mentions* black vomit as of very frequent occurrence in the cases which fell under his own notice.

Sequelæ.—These were, 1. A peculiar form of ophthalmitis, usually preceded by amaurotic symptoms. 2. Glandular swellings. 3. Boils and cutaneous eruptions. 4. Effusion into the knee-joint. 5. Swelled legs and ankles. 6. Pain in the feet, with and without swelling. 7. Paralysis of the deltoid, and certain other muscles. 8. Sloughing of parts.

The occurrence, in a considerable number of cases, of a peculiar inflammatory affection of the eye, taking place during or after convalescence, was an interesting feature in the epidemic. The affection is described by Dr. Mackenzie under the name of *post-febrile ophthalmitis.* It appears to have occurred in greater proportion in Glasgow than in the cases treated in Edinburgh and elsewhere. In the Glasgow Eye Infirmary 36 cases occurred between the 8th of August and the 31st of October. It was characterized by amaurosis, or imperfect vision, affecting one or both eyes, and inflammatory action, extending from the retina to the other tunics of the eyeball.

These attacks occurred at various periods from three to sixteen weeks after the accession of the fever. In several instances they happened about two weeks after convalescence from the relapse, but generally later.

The same disorder, it would appear, occurred after the Dublin epidemic of 1826, and was described by Mr. Hewson, Dr. Reid, Dr. Jacob, and Mr. Wallace, confirming the views we have adopted of the identity of the epidemics.

The treatment pursued with the greatest amount of success by Dr. Mackenzie was similar to that followed in cases of rheumatic and syphilitic iritis, and consisted principally of blood-letting, followed by calomel and opium, dilatation of the pupil with belladonna, and counter-irritation.

Anatomical Characters.—*The post-mortem appearances* were, 1. Abundance or even excess of bile, and a pervious state of the biliary ducts; and 2. More or less congestion of organs, with frequently, extravasation of blood in various situations. These appearances are either identical with, or analogous to, what the majority of observers have noticed and described, as being those which are found in persons dying of yellow fever, and correspond remarkably with those observed by the French

* [Letter on the present Epidemic of Dundee. Scottish and North of England Med. Gaz., vol. i. p. 129.]

commission at Gibraltar, in 1828; particularly in reference to the peculiar condition of the liver, which Louis considers the anatomical character of yellow fever.

State of the Blood.—That the blood really was in a dissolved state, was made perfectly manifest *first*, by the imperfect coagulation which it underwent when drawn from the veins of patients, a homogeneous spongy mass being formed, in place of a firm fibrinous clot, with a supernatant serosity; *second*, by the ecchymosis which was uniformly observed to surround flea-bites or other slight injuries of the skin; *third*, the frequent occurrence of purpurous spots; *fourth*, the hemorrhages; and *fifth*, the discoveries made by the microscope. "Professor Allen Thomson," Dr. Cormack says, "had the goodness to lend me his able assistance, in examining the blood of a number of my patients, by means of the microscope. A few drops were taken from the thumbs on the same day (24th Oct.), of about a dozen persons, some of them in the pyrexial, and others in the apyrexial stage of the disorder; and it was found, that in all of them there were an unusual number of pus globules; and in some cases, in addition to this, all the globules were found serrated and notched."

One of the most interesting facts connected with the pathology, was the discovery of urea in the blood and serous fluid of the ventricles of the brain, in some of the patients affected with cerebral derangement. The suspicion of this morbid condition was suggested to Dr. Henderson partly by the occurrence of convulsions in several cases in which there was no jaundice, and partly by a case in which symptoms of oppression and confusion of mind, accompanied with diminution of urine, was relieved by the occurrence of diuresis after the exhibition of diuretics. In two cases which subsequently occurred, exhibiting indications of cerebral oppression, the state of the urine was attended to and the blood analyzed. In both cases the symptoms came on after the critical sweat; and the urine was somewhat diminished in quantity, although not materially. In one case, the patient, after oppression, stupor, and a repetition of convulsive fits, died, and three drachms of serum from the ventricles of the brain, with some clots of blood from the head, were examined. Crystals of nitrate of urea were obtained in moderate abundance from the serum of the brain, and a very considerable quantity from the blood. In the other case, after somnolence, confusion, and languor, blood drawn from the arm yielded crystals of urea in small quantity. The character of the symptoms which succeed *suppression of urine*, and the explanation afforded of such cases by the detection of urea in the blood, have been long known to the profession. The possibility that a similar condition of the blood might be found to occur in other affections, and might afford the true explanation of sudden

death in diseases not expected to terminate thus, was suggested, we believe, by Dr. Christison. But we have here, for the first time, met with the realization of this conjecture, in the proof afforded by the observations of Dr. Henderson, that such an event may prove the immediate cause of death in cases of *fever;* and that, too, even in cases where the obvious cause which might give rise to the presence of urea in the blood—namely, the *suppression* of urine—was absent.

The facts elicited in these observations led to the further investigation of the subject in Dr. Henderson's wards, by Mr. M. W. Taylor; and in other two cases of fever—one of the epidemic, and one of typhus, both exhibiting the development of cerebral symptoms, with *diminution* of the urinary secretion—a circumstance otherwise indicating a favourable prognosis—urea was detected in the blood. "The existence of urea in the blood," says Mr. Taylor, (*Scottish Med. Gaz.*, p. 281,) "in other cases has been inferred from the occurrence of those symptoms of disorders of the nervous centres, which we know to be the consequence of its undue accumulation in the circulation. These phenomena have been observed in those cases in which, from some cause or other, the daily discharge of urine has undergone material diminution. This appears to take place chiefly at that critical period of the fever marked by copious sweating, at which the febrile symptoms begin to subside, or during the apyretic intervals between the attacks. Professor Henderson was the first who drew the attention of the profession to the fact of the occasional presence of urea in the blood, at this stage of the fever, under the above-mentioned circumstances." The inferences deduced by Dr. Henderson from these observations are of great practical importance, and may prove to be so in relation to the treatment of other fevers besides the one under consideration.*

Prognosis.—The mortality was exceedingly small. By Dr. Alison it is stated not to have exceeded one in thirty. According to Dr. Craigie, the mortality in his wards was not more than one in sixty; by Dr. Kilgour it is stated to have been less than one in thirty-five in Aberdeen; by Dr. Makenzie, to have been about three and a half per cent. in Glasgow; and from Dr. Arnott's paper, it appears to have been only about one per cent. in the Dundee hospital. Dr. Cormack never saw any one, old or young, die of the ordinary form of the fever. A deep persistent, purple colour of the face appearing before, or immediately after the invasion of the disease, is a certain prognostic of danger according to the same authority. The states considered by Dr. Cormack as most apt to cause death, and therefore "to be anx-

* [British and Foreign Medical Review, vol. xvii. p. 190.]

iously looked for, and if possible, promptly corrected," are 1st. Congestion of the mucous membrane of the stomach and intestines, terminating in effusion of blood and subsequent destruction of large portions of this tissue. 2d. Congestion of one or more of the abdominal viscera, particularly of the liver and kidneys, disabling them from the performance of their secretive functions, thereby causing bodies to circulate with the blood, which ought to be separated from it, and which bodies we know act as poisons when not so eliminated from, or when directly introduced into the circulation. 3d. Debility and sinking. (p. 150.) With regard to the first state, in two or three of the cases recorded by Dr. Cormack, debility and sinking, followed by death, appear to have been occasioned by hemorrhage from the stomach or bowels; and in those cases, exudation of dark-coloured blood, on and under the mucous membrane of the stomach and intestines, was found to a considerable extent upon examination after death. As to the second cause of death, it refers principally to the development of urea in the blood, as pointed out by Dr. Henderson; but we have already sufficiently commented upon that point, and on the important relations which it bears to the treatment of this and, probably, of other fevers. In as far as the cause referred to (congestion of the abdominal viscera) is stated to have operated through the medium of the liver, we think there is every reason to believe, from the evidence before us, that the cases affected with jaundice were not more fatal than the cases not so affected. The debility and tendency to sinking were produced, we think, most commonly by the occurrence of diarrhœa, or by the profuse sweating which formed the most frequent crisis of the fever.

Nature.—The disease was undoubtedly contagious, though not to a great degree. Long-continued exposure to the poison, especially in persons who had to undergo great fatigue, generally was followed by an attack. In Dr. Cormack's hospital all the clinical clerks, hardly any of the nurses, laundry-women, or others coming in contact either with the patients or their clothes, have escaped; at one time there were eighteen nurses off duty from the fever; and of those who have recently been engaged for the first time, or of those who have hitherto escaped, one and another is from time to time being laid up.

From the number of laundry-women that were attacked, it appears, that the clothes of our fever patients were especial repositories and communicators of the morbid poison. An interesting fact, which may be introduced here, as it is probably to be explained by what has just been stated, was communicated to Dr. McCormack by Mr. Nicholson, from the island of Skye. He informed him, that two reapers, who had had the fever in Edinburgh, arrived in his neighbourhood after their return home

at the close of the harvest, when not a single case of the fever had been seen in the district. The mother of these persons, with whom they lived from the time of their arrival, was, in a few days, seized with the disease, and died. Other severe, and, in several instances, fatal cases occurred among the neighbours, who had waited upon her; and the disease was then spreading to such an extent over the whole territory as greatly to alarm the inhabitants.

In the best districts of the new town of Edinburgh, there were a considerable number of isolated cases, but there was no instance of the disease propagating itself in these localities.

It is a curious and interesting question, whether this form of fever proceeded from the same poison as the usual continued or *typhus fever* of Great Britain, or was truly a distinct disease.

While Dr. Alison apparently inclines to the idea that this kind of fever originated from the same poison as the usual typhoid fever of Edinbugh, he points out with great discrimination the characters by which it was distinguished from the strictly typhoid cases. The peculiarities referred to by him are: 1. The duration of the cases, which was uniformly short; the crisis occurring in most of them on the fifth or seventh day, very few being protracted beyond the ninth. 2. The absence of the measly eruption of typhus. 3. The frequent occurrence of jaundice, accompanied by more or less fullness and tenderness in the hypochondrium, and vomiting of green bile, or brownish matters like hare-soup. 4. The unusual degree of sickness and vomiting both in the jaundiced cases, and in others. 5. The constant, or almost constant, occurrence of a relapse, generally taking place on the fourteenth day. 6. The termination of the disease, in the great majority of cases, by profuse critical sweats. 7. The frequency of severe muscular pains of a rheumatic character, during and after the sweatings, and particularly after the relapse. 8. The mortality, which was very small. The last peculiarity noticed by Dr. Alison, is the fact that in every pregnant woman affected with the fever who came under his care, abortion took place.

Dr. Cormack states, that "when he commenced the observation and study of the present fever, and indeed, for a considerable time afterward, I regarded it as *essentially and totally* different from typhus; but recent circumstances, and more matured weighing of evidence, have greatly modified this opinion." This though we think without sufficient evidence. Professor Henderson, as well as Dr. Craigie, advocate the opinion of the non-identity of the poison from which the two fevers originate. One of the most remarkable peculiarities, and the first which attracted the notice of Dr. Henderson, was the great frequency of the pulse in the new disease as compared with typhus, and the very different prognosis which was afforded by its frequency in the two diseases.

This comparison, in consequence of the short duration of the epidemic fever, was necessarily limited to the first five days; and referring to examples in which it had been made, Dr. Henderson found the average frequency of the pulse in typhus on or before the fifth day, to be 100 per minute, while in the epidemic fever it was 123. He further observes, that according to common observation, a great frequency of the pulse in typhus fever, more particularly at an early stage, is deemed by practical men one of the most alarming symptoms next to those which proclaim immediate dissolution; while in this epidemic it appeared to have no special indication. In the epidemic fever, the pulse was frequently as high as 140 or 145 on the second or third days, and the crisis took place as usual on the fifth, without any indication of danger, while in typhus, even a less degree of frequency was followed by a very large proportion of deaths.

The next peculiarity noticed by Dr. Henderson is the mode of termination and rapidity of convalescence in the epidemic fever, as contrasted with typhus.

The constant occurrence of one or more relapses is next pointed out by Dr. Henderson as one of the distinguishing features of this fever.

In the fever under consideration, however, after the critical sweat of the fifth or seventh day, and a total though temporary remission, almost invariably a relapse, in the strict use of the word, that is to say a fresh attack of the fever took place, generally on the fourteenth day, ushered in by shivering, and running nearly the same course as the primary attack. With reference to the bearing of these upon the specific difference between typhus and the fever in question, Dr. Henderson remarks:—

"That the difference in this respect between the two is a highly important one, I do not suppose that any one can doubt, and when I add that the cases of true typhus, which have occurred among the same class of the population, and at the same seasons, as the other disease, have presented no such tendency to relapse, or repetition of fever, as the latter does, it will appear, I conceive, that the liability to repetition cannot be esteemed other than a distinctive feature of the one disorder, and the absence of such a liability, a distinctive feature of the other, and that neither is dependent on accidental diversities in the epidemic constitution, either of the atmosphere or of the population, by which the effects of one and the same poison, might be presumed to be modified or altered."

Dr. Henderson cites a number of cases where the *two forms* of fever were exhibited in the same persons within a short period of time; some being affected with typhus soon after recovery from the epidemic, and some with the epidemic fever within a few weeks after their recovery from typhus. These facts, in the opinion of

the writer, appear, and with justice, to lead to the conclusion not only that the dissimilarity of the fevers cannot be referred to the modifying influences of constitution and season, but that they must have arisen from poisonous influences originally different in their nature and source.

"The history of the progress of the epidemic fever, and that of the cases of typhus occurring during the same period, develops other facts of interest in relation to the point in question; for, in the cases investigated by Dr. Henderson and others, the atttack of the epidemic fever was invariably traced to intercourse with persons affected with the same form of fever, and in cases of typhus to persons affected with typhus, while in no instance could any case be referred to the contagious influence of the other form of fever. In some of the cases referred to, the two forms of fever prevailed in the same locality but in different houses; and in such instances the cases of the epidemic invariably came from that part of the locality where other cases of a similar kind prevailed, and those of typhus from the houses alone which the typhoid affection had visited,—facts which go very far to prove a difference in the kind of poison from which the two fevers originated." *

Dr. Cormack considers the *bronzing* of the countenance as an interesting point of resemblance between the yellow fever of hot countries and this epidemic, and aims at establishing an analogy, if not an identity between the two fevers. Dr. Craigie altogether rejects the idea of the fever bearing any analogy to yellow fever. "It is scarcely possible," he says, "with any consistency in nosology, or common obervation, to admit even the resemblance."

History.—We have regarded this epidemic as similar to those described by Dr. Christison, as having prevailed in Edinburgh in 1817–20, and 1826–29, along with cases of typhus, from which it was steadily and uniformly distinguished as the five-day fever. In the mode of invasion, state of the pulse, the duration, the occasional jaundice, the critical sweats, the relapses, the occurrence of rheumatic pains during convalescence, and other particulars, the cases were precisely alike.† Dr. Mackenzie says, "That it has at different times prevailed in Ireland is rendered highly probable from the fact that the course observed by some of the Irish epidemics corresponds exactly with that of the fever now present in Glasgow, while the complete identity of this fever, with that which prevailed in Dublin in 1826, is proved by the exact similarity of the affection of the eye, observed as a sequela in both instances. In Rutty's History of the Diseases of Dublin during forty years, we meet with several instances of an epidemic

* [British and Foreign Medical Review, vol. xvii. p. 185.]

† [On the Efficacy of Blood-letting in the present Epidemic Fever of Edinburgh, by Benjamin Welsh, M.D., 1819.]

of the same character with that now under consideration. Thus in July, August, September, and October, 1739, a fever prevailed, which was 'attended with an intense pain in the head. It terminated,' says he, 'sometimes in four, for the most part in five or six days, sometimes in nine, and commonly in a critical sweat: it was far from being mortal. I was assured of seventy of the poorer sort at the same time in this fever, abandoned to the use of whey and God's good providence, who all recovered. The crisis, however, was very imperfect, for they were subject to relapses, even sometimes to the third time.' (p. 75.) He describes the same remittent fever as occurring also in 1740, 1745, 1764, and 1765; noticing as a circumstance of the disease in 1765, that the bowels were in some instances remarkably affected. There appears considerable resemblance between the present fever and that described by Dr. Stoker, as prevailing along with typhus gravior in Dublin in 1816. He speaks of it as a *typhus mitior*, its usual course being from three to nine days, generally terminating on or before the seventh day, but very apt to relapse on the third or fifth day from the favourable change. The Dublin epidemic of 1826, with which the present fever corresponds so exactly in its effects on the organs of vision, was also a remittent fever, as appears from the accounts published* of it by Dr. Reid and Dr. O'Brien. It was often attended by jaundice, and by pains in the bones; its crisis happened generally about the seventh day; the patients were very apt to relapse; the number attacked was very great, but the mortality comparatively small—in all which particulars its analogy to the present Glasgow fever is borne out. Dr. O'Brien's Report might be applied to the disease now prevailing in this city, with scarcely any modification."—(*Lond. Med. Gaz.*, Nov., 1843.)

Dr. Spillan† has called attention to the resemblance of this epidemic, *in all the important features*, to that described by Hippocrates as occurring in the Island of Thasus, off the coast of Thrace. The same state of the spleen is mentioned. (*Clifton's Ed. of Hippocrates on Air*, &c., p. 62.)

Treatment.—The treatment of this epidemic was exceedingly simple, and in the majority of cases seemed to have but little influence on the issue. All attempts to cut short the fever, to accelerate the crisis, or to prevent the relapses, seemed to have failed. The disorder ran its course, terminated at the usual period, and in the usual manner, equally well under one plan of treatment as another, or even of none. Blood-letting, both general and local, appears to have afforded great relief, in the

* [Transactions of the Association of Fellows and Licentiates of the King and Queen's College of Physicians in Ireland, vol. v. pp. 266. 512. Dublin, 1828.]

† [Lond. and Edin. Monthly Journal, Feb., 1844, p. 176.]

experience of Dr. Alison and others, to the violent headache, and other uneasy feelings of the early stage of the fever; and could be had recourse to without those apprehensions of protracted weakness and exhaustion, which form the great obstacle to contend with in most cases of typhus fever. The tenderness in the epigastrium or hypochondriac regions, with indications of enlargement of the spleen, appear to have yielded readily to the application of leeches. Dr. Cormack rather inclines to discountenance blood-letting, convinced that the latter symptoms give way with equal readiness after the diligent use of warm fomentations, and the former after the use of purgatives and cold applications to the head. He thinks that the headaches return soon after the blood-letting, although temporarily relieved, and appears to dread the debility which may ensue upon the use of such a remedy. Diaphoresis appears to have occurred spontaneously on the critical day, and to have been as profuse and as beneficial when no diaphoretics were used as when they were; and although they were pretty constantly employed, they did not appear, in any instance, to accelerate the crisis, but they afforded relief or satisfaction to the feelings of the patient. The administration of opium, and the external application of blisters or sinapisms to the epigastrium, were found very serviceable in allaying one of the most troublesome symptoms—the vomiting. In some instances Dr. Cormack tried creasote, in others hydrocyanic acid, for this symptom, and with marked success. The application of cold to the head for the purpose of allaying headache, and the use of cold or of hot, or tepid sponging of the surface of the body in allaying restlessness, were found by Dr. Cormack to be very useful and grateful to the patients. The administration of purgatives was found useful in mitigating the symptoms, and particularly in relieving the headaches. Croton oil was prized by Dr. Cormack, because, in spite of its activity, he did not find that it produced irritation; but that, on the contrary, it appeared to soothe the gastric irritability and nervous excitement, and to leave the patients little exhausted, even after its free and frequent action. Mercurial purges appear to have been preferred by Dr. Craigie and others in the treatment of the jaundiced cases, but, after trying them extensively, Dr. Cormack concludes that the cases went on at least as well without them. The rheumatic pains with which the patients were affected during convalescence, do not appear to have been very amenable to treatment. From the use of colchicum, Dr. Cormack does not think his patients experienced any benefit. Astringents, chalk mixtures, acetate of lead and opium, acetate of lead and squills, &c., were found very serviceable in the cases complicated with diarrhœa, dysentery, and bronchitis; and tonics, with the occasional administration of stimulants, in the debility which, in many cases, accompanied and

followed the crisis. The chlorate of soda was used, but without any decided evidence of its advantages. The sulphate of quinine, both in small and large doses, frequently repeated, and other reputed anti-periodic remedies, were tried in a great many cases, with a view to prevent the occurrence of relapse; but, although Dr. Cormack conjectures that the former remedy modified or delayed the relapse, none of them appeared to have any effect in the prevention of its occurrence.*

In June, 1844, a vessel arrived from Liverpool at Philadelphia, with a number of Irish emigrants. There had been some sickness on board of the ship during her passage to this port. After her arrival, about fifteen of her passengers were admitted into the Philadelphia Hospital, suffering under a form of fever unlike any variety which has prevailed here for the last fifteen years—the period over which the writer's observations extend. The writer thought he recognized the form of fever just described, and the event proved the correctness of his supposition. The disease was precisely similar to the Edinburgh epidemic, except the sequelæ; and these might possibly have occurred, as the patients left the hospital as soon as the second convalescence was established. The disease, so far as the writer knows, did not extend; and the only evidence of its contagion existed in two cases. Two sisters who had been residents of the city for several years, but whose brother had arrived out in the ship, and was taken with the fever at their house, were admitted into the hospital, suffering from decided attacks of the disorder. Several of the passengers were also inmates of the hospital, suffering from slight chills and sweatings, general uneasiness, some headache and vomiting, with prostration of strength, but finally recovered without experiencing a decided attack. Several cases from the same vessel were admitted into the Pennsylvania Hospital, under the charge of Dr. Pepper; who at first regarded them as cases of mild typhus, but subsequently recognized their resemblance to the Scottish epidemic described by Alison, Cormack, Henderson, &c. None of the cases which fell under the writer's notice terminated fatally.

A form of Inflammatory Fever, described by Dr. Felix Jacquot,† as occurring amongst a portion of the garrison of Paris, prevailed in the hospital of Val de Grace, in the spring of 1844. After two or three days of illness, the sufferer entered the hospital. In nearly all there was fever from the commencement, though in a few the initial chill occurred, whilst in others there were slight chills subsequently. The febrile action was severe and continued, with, in some instances, daily exacerbations

[* B. & F. Med. Rev., vol. xviii. † Gaz. Med., tom. xii., 1845.]

towards evening, occasionally preceded by slight, short chills. In nearly all there was slight, continuous frontal cephalalgia; epistaxis occurred in a few cases; there was sometimes cough, with sibilant rhonchus; in a small number there were vomiting and nausea; thirst and anorexia in all; and in nearly all diarrhœa, or diarrhœa alternating with constipation. The stupid expression invariably observed in typhoid fever was absent; the patients talked freely, willingly, and for some time; the sleep, though bad, was not troubled with dreams. The duration of an attack was from four to twelve days. The epidemic commenced about the latter part of April, and terminated in the beginning of June.]

C. SYNOCHUS, [OR TYPHOID FEVER.

Syn. *Typhus Mitior*, Cullen; *Febris Mucosa*, *F. Mesenterica*, Baglivi; *Morbus Mucosus*, Roederer and Wagler; *Fièvre Adèno Miningèe*, Pinel; *Fièvre Typhoide*, Fr.; *Dothinentèrie*, Bretonneau; *Mucous* F.; *Pituitous* F.; *Common Continued* F.; *Slow Nervous* F.; *Abdominal Typhus*; &c.]

This is probably the most frequent of all types and forms of continued fever. It is essentially characterized by the disease commencing as synocha and terminating as typhus. There are scarcely any cases of primary continued fever, which do not present an inflammatory stage of longer or shorter duration, and of more or less violence at the commencement; so that, perhaps, all continued fevers not falling under the purely inflammatory type, might be considered as synochus. But in nosological arrangements, as well as in practice, the term is usually, and in reference to treatment conveniently, restricted to such primary fevers as begin with a distinctly marked inflammatory stage like synocha, lasting for at least a few days, and not giving way to adynamic or typhoid symptoms till the beginning of the second week at soonest. Such was the general nature of the epidemic fever which raged in the United Kingdom from 1817 till six or eight years ago; and such too seems to have been the *Febris Bellica* of the Continent, which broke out in the large towns of Germany and other continental countries of Europe in 1814, subsequently to the French war; and of which, indeed, the British epidemic was probably a propagation. Under the same head may be classed most of the fevers described by English authors of the last century, under the name of nervous fever. The most remarkable examples of it which have perhaps been ever seen, occurred in the British epidemics of 1817–20 and 1826–9. For the inflammatory stage was often so well marked, that it was impossible to tell for some days whether the disease was to terminate as synocha, or pass on to the typhoid stage of synochus; while, on the other

hand, the typhoid characters of the advanced stage were often in those very cases so well developed, that no one, seeing the disease for the first time at this period, would have known from the symptoms that it had ever been anything else than true typhus. In later years the inflammatory stage has become much less prominent; and in the generality of cases, at least in Edinburgh, as well as in other great towns, it has at present almost disappeared, and given place to typhoid symptoms from a very early period of attack.

Symptoms.—In describing synochus it seems unnecessary to enter into particulars. The details of the typhoid stage are exactly the same with those which will presently be given under the head of typhus. Those of the inflammatory stage have been already related at sufficient length under that of synocha. In synochus, as in synocha, the fever is sometimes simple, but much more frequently complicated, as in the latter, with local inflammation in the early stage. Later in the disease, when typhoid symptoms are formed, local inflammations and local congestions frequently appear as in typhus, and more frequently than these secondary disorders are observed to show themselves in the early stage. Yet, even in the latter stage, secondary affections are sometimes absent, so that we have a pure, uncomplicated, primary synochus from first to last. Cases of this nature were clearly observed during the British epidemics above referred to. The most common secondary affections in this, as in the inflammatory form of continued fever, are, in Britain at all events, inflammatory diseases of the lungs—pleurisy, pneumonia, but especially catarrh, often passing into bronchitis.

The passage of synocha into typhus usually takes place, as already remarked, in the course of the second week. It is indicated by the pulse opening up as it were, becoming fuller, more compressible, though still often equally jarring, and falling at the same time somewhat in frequency. The tongue also acquires a brown dry streak down the centre; the heat is less pungent, while the skin is equally dry; but, in particular, the muscular exhaustion increases greatly; the senses, from being irritable, become more obtuse than natural, especially the sight and hearing; the integuments, from presenting a bright red flush, acquire a dingy reddish-brown tint, of the nature of congestive redness; and there is a marked tendency to doze, sometimes intermingled with slight muttering delirium. These changes gradually lead on to the state of true typhus in its characteristic form, which will now be described.

[The reader is referred to the section on the *Typhoid Fever* of this country, by the editor, for further details of this variety of continued fever.]

D. TYPHUS.

[Syn. *Synochus Putris; Pestis Bellica; Typhus Gravior*, Cullen; *F. pestilentialis Europæ; Typhus Contagiosus Exanthematicus*, Hildenbrand; *Fièvre adynamique ataxique*, Pinel; *Typhus Contagieux, Fièvre d'Hôpital*, Fr.; *Der Ansteckende Typhus, Das Ansteckendefieber, Das Exanthematische Nervenfieber, Kriegspest*, Germ.; *Tifo Contagioso, Febbre Putrida*, Ital.; *Febbre Petechiale*, Rossi; *Jail Fever, Putrid F.; Spotted F.; Exanthematic Typhus;* &c. &c.]

As Synocha passes by insensible shades into Synochus, so the latter passes insensibly into Typhus. The early stage of inflammatory symptoms may be observed in different cases to be shorter and shorter in duration, and more and more intermingled with nervous depression or adynamia, till at length we have a fever, in which the inflammatory reaction is never characteristic, and is followed at an early period even of the second week by the same phenomena which constitute the latter stage of synochus.

The term Typhus has gradually acquired of late a rather vague signification. In consequence of passing into unprofessional language, it has come gradually to signify, in familiar speech, *Infectious Fever;* and in this signification it is used even by many physicians. In correct nosographical language it should comprehend only those fevers where the characters of adynamia, or nervous depression, present themselves as the predominant feature of the disease from first to last. But in practice the term has been extended from this very restricted meaning, so as to embrace that far more numerous class of cases where such characters show themselves before the close of the first week, and where the earlier stage of pure inflammatory action, although present, is not well marked. In this sense typhus is scarcely less important than synochus in point of frequency. In many epidemics it is the ruling form; and, for a few years past, in Britain generally, and especially in Edinburgh, it has constituted almost the sole prevailing type.

Definition.—Typhus may be defined, *a fever characterized by a compressible, rather frequent pulse, little increase of the animal temperature, extreme languor and debility, and much disturbance of the mental functions.* Some, following the example of Cullen, indicate as another character its origin in infection; which, however, is by no means peculiar to this alone among continued fevers; neither is there a certainty that it is an invariable character even of typhus. The most remarkable circumstances in typhus are the great exhaustion of the muscular strength, and the torpor of the mental functions, often mingled with delirium. The latter character is undoubtedly the foundation of its name, which is derived from τύφος, stupor.

Under this definition, and therefore under the specific name of typhus, may be arranged a very great variety of epidemic fevers, which have been variously denominated, by the writers of the last century especially, *Low Fever*, *Low Nervous Fever*, *Jail Fever*, *Camp Fever*, *Hospital Fever*, *Malignant Fever*, and the like. These will be all found, on referring to the descriptions of authors, to arrange themselves under the head of fever marked by the predominance of nervous exhaustion, as shown by feebleness of the pulse, prostration of the strength, and torpor of the functions of the mind.

[History.—Typhus Fever has probably existed from the remotest antiquity. The epidemic which occurred at Athens during the Peloponnesian war was probably typhus. It was the typhus camp fever, which prevailed in the Carthagenian army, at the siege of Syracuse, an excellent description of which may be found in the writings of Diodorus, the historian ; and other instances are mentioned by Livy, all of which appeared in the midst of large armies. Aetius gives an account of an exanthematous fever, (*Tetrab.* ii. sect. 1, cap. 12,) which we have every reason to infer was typhus. Subsequently the Arabian physicians, and Jacques Desparts, one of the commentators of Avicenna, designate it very clearly. Actuarius, and still later Cardano, of Milan, Nicholas Massa, (*De Febre Pestilenti*, 1540,) and Georges Agricola, (*De Peste*, lib., 1554,) make frequent mention of this disorder in their writings. But it was not generally known, or accurately described until the XVIth century; since that period extensive epidemics of typhus have prevailed throughout Europe. That of 1528, which carried off 21,000 men from the French army, then occupying Italy, was one of the first; and the description of it by Frascator has always excited much attention. Afterwards came the epidemic of 1552, which decimated the army of Charles V at the siege of Metz, (*Math. Unzer. Catoptron Loimides S. de lue pestefera*, lib. 3, Halæ, 1615.) In 1566, it broke out in the army of Maximilian II, then collected in Hungary to oppose the Turks, spread over a great part of Europe, and was known under the name of Febris Hungarica. Since then it has appeared during all of the European wars, and at periods of general suffering and famine. The plague of Misnia in 1676, that of Denmark in 1613, and 1652, and that of Leyden in 1669, were all examples of contagious typhus. Ozanam, in his History of Epidemics, mentions more than two hundred epidemics of typhus. It has appeared frequently in Ireland, and occasionally in England and Scotland. During the wars of the French Revolution it followed in the train of the vast armies then collected, spread through Germany, Switzerland, Italy, and France, committing the most destructive ravages. The "Spotted Fever," which prevailed in New England between 1807 and 1816, is

generally regarded by writers, as true typhus fever. Dr. Gerhard thinks,* that some of the epidemics which prevailed in the Middle States, between the years 1812 and 1820, were of typhus fever. The epidemic fever which devastated Italy in 1816–17, was, as regards symptoms, identical with the British typhus. (Palloni, *Febbre Tifoide*, &c., p. 150.)]

Symptoms.—It has been seen above that inflammatory fever, in general, commences abruptly; and such also is the case with characteristic instances of synochus, where the inflammatory type and stage are well-marked. Typhus, on the contrary, and in common with it those cases of synochus which approach the typhoid form, in general begin gradually. Epidemics, indeed, have been described, where the patient is at once struck down by typhoid prostration; and in all epidemics, instances of the kind occasionally present themselves to the physician's notice. [The period of *incubation*, or that which elapses from infection until the manifestation of the disease, ranges from a few hours to five or six weeks. Boudin (*Essai de Géographie Médicale*), relates an undoubted instance where this stage lasted for a month. Sometimes patients are enabled to indicate the exact moment that they are attacked. J. Frank mentions the case of his brother, who believed that he knew the instant the contagion entered his system. Drs. Marsh, Tweedie, and Gregory give examples of instantaneous affection after exposure to the contagion. Dr. Alison knew a physician to be attacked at the bedside of a fever patient. Dr. Gerhard records two instances, where an attack followed exposure almost immediately. An attendant in the hospital was employed to shave a man, who died shortly after; during the operation he inhaled his breath, which had a nauseous, disagreeable odour; one hour afterwards he was seized with the disorder, and had it severely. Another, in raising up a typhus patient about dying, felt the acid perspiration of the moribund upon his skin; he was seized with typhus almost immediately afterwards. Hildenbrand, however, denies that an individual can ascertain the time the infection takes place. He says that he paid particular attention to the sensations which occurred in his own person while sitting at the bedside of typhus fever patients, in order to ascertain whether he could perceive any peculiar feeling arising from the contagion; and, although he contracted the disease, and knew the patient who communicated it to him, he was wholly unable to distinguish any peculiar impression depending on the contagious poison. In a large majority of cases the accession of typhus fever is gradual.] But much more generally the disease begins with slight languor, trivial headache, disturbed sleep, deficient

* [Am. Journ. Med. Sciences, 1836.]

appetite and inaptitude for mental or bodily exertion. In a day or two, or sometimes after an interval of several days, an attack of chilliness or rigor first convinces the patient that a serious illness is impending, and ushers in the unequivocal symptoms of fever. The pulse is now rather frequent, ranging between 90 and 100, seldom higher except in the young or in irritable habits, occasionally natural, or even under the healthy standard; and it is generally full, sometimes, however, small, commonly jarring at the extremity of its expansion, and always easily compressible. The tongue is white, often with red points from enlargement of the papillæ; and this state is attended with complete loss of appetite, as well as urgent thirst. The strength is greatly reduced, and there is a peculiar sense of exhaustion, felt even while the patient is in bed and at rest. The breathing is somewhat accelerated, short, with occasional sighing. The skin is rather hot, but seldom in such a degree as to occasion the desire for cold air, or to affect decidedly the hand of the physician. The bowels are commonly constipated; the urine not high-coloured, or loaded on cooling, with sediment; the breath fetid, and in some measure peculiar; the cutaneous secretion either unaffected, or at times assuming the form of irregular sweats, partial, of short duration, and unattended with any abatement of the fever. The countenance is generally dingy, flushed, languid and oppressed; the eyes somewhat injected, watery and heavy, with unsteadiness of vision, but seldom much intolerance of light; the whole expression is peculiar, so that by it alone an experienced physician may commonly recognize the disease. [The patient is averse to any exertion, answers questions tardily, protrudes his tongue slowly, and frequently is incapable of withdrawing it. There is a dull, stupid expression of the countenance, together with a characteristic suffusion of the face and eyes. The hue of the face is a dull, livid red, extending over its whole surface, corresponding with a strong, dark injection of the conjunctivæ. This congestion extends to the mucous membrane of the nasal fossæ, pharynx, larynx, and even to the bronchi, as exhibited by the difficult deglutition, coryza, oppression, and cough.] There is almost always more or less headache, though it is often very trivial; also commonly ringing or buzzing in the ears, with an undefinable sense of obscurity or distance of sounds, unconnected, however, with deafness; the ideas are confused, and the patient complains much of giddiness when he sits or stands. General pains, especially in the back, and febrile weariness and restlessness, though often present, are seldom so distressing as in synocha, and the early stages of synochus. Sleep is disturbed, and the patient imagines he gets none. Sickness is frequent, also vomiting, and still more a sense of fullness in the epigastrium; yet these symptoms are far from invariable, as some pretend. [Many writers

speak of epistaxis, as a common and important symptom occurring about the third or fourth day, and about this time the peculiar eruption appears.

In the generality of cases, the symptoms here described continue with little variation, except in degree, till towards the close of the first, or more frequently the beginning of the second week. In a few, little change takes place even then, except that some degree of stupor is observed, in connection with dryness and brownness of the tongue, listlessness, unwillingness to be disturbed, and progressive anæmia; and recovery commences in eleven, fourteen, or seventeen days. In others, on the contrary, the characters of aggravated typhus form even about the middle of the first week; but such cases are rare.

Most generally at the beginning of the second, or close of the first week, the tongue becomes brown, dry, often chapped, and the teeth covered with dark sordes; the pulse is either more soft or more jarring, yet compressible, and usually about 100 in frequency; the skin continues dry and not particularly hot, becomes often rough, harsh and dingy, and frequently presents eruptions, which will be described under the head of the secondary affections. [The perspiration has a peculiar odour, mentioned by most writers, and regarded as characteristic. Dr. Pickels says, that upon entering the room of a typhus patient, the presence of the disease was indicated, previous to any examination, by this peculiar fetor from the skin. Dr. Doane informed Dr. Bartlett, that many of the emigrant patients with typhus fever, at the New York quarantine Hospital, gave out an odour which he described as sour, dirty, and offensive. Dr. Gerhard says, that the odour is pungent, ammoniacal and offensive, especially in fat, plethoric subjects. It has been said to resemble that from a mouse.] The evacuations are dark and fetid; the heat of the surface is little increased, but irregularly distributed, especially in the extremities, which are apt to become cold; the temperature is seldom much above the natural standard, often below, and occasionally, it is said, so low as 92° F.; there is little complaint, except of weakness and want of sleep; sickness and vomiting, if previously present, disappear; the eyes are more suffused and heavy, the complexion darker and less flushed, and the expression that of disturbed oppressive sleep. The muscular debility and sense of exhaustion are very great, sometimes excessive, and accompanied at times with a tendency to fainting; and in a few cases the disease is brought to an abrupt termination by fatal syncope induced towards the end, or even sometimes the beginning of the second week, by some imprudent effort of the patient to sit up in bed, or rise to stool. There is also, commonly, wandering of the mind, marked by slight incoherent muttering and occasional incorrect answers, sometimes by more active delirium and constant incoherent

rambling, and at times by loud talking and tendency to roam about; [or, the patient dreams without being asleep (*typhomania*), is tormented by a single idea, which is generally an internal impression, and disregards all external objects.] In some the tendency to get out of bed and wander up and down is inveterate, so that constant attention is required to prevent accidents. [Deafness is frequent at this stage of the disorder; complete vision is impaired; and sense and taste lost. The patient appears to be in a state resembling somnambulism; he lies perfectly insensible to all around, and, if aroused, answers that he is quite well.]

It is generally observed that the symptoms undergo an exacerbation during the evening and early part of the night, and a remission in the morning and early part of the forenoon. The double exacerbation, conceived by some to occur at midday as well as midnight, is either imaginary and founded on preconceived theory, or must be present only in special epidemics, and has been rarely witnessed for many years past.

[We insert the following table, showing the maximum frequency of the pulse, in 181 cases of eruptive typhus, admitted into the Glasgow Fever Hospital, from May 1st, to November 1st, 1839.

Table of the Maximum Frequency of the Pulse in 181 *Cases of Eruptive Typhus.*

Males.		Females.	
Maximum frequency of Pulse.	Number of Cases.	Maximum frequency of Pulse.	Number of Cases.
86	5	96	12
96	20	98	1
100	8	100	3
104	4	104	5
106	3	108	23
108	15	110	1
110	1	112	3
112	4	116	3
116	4	120	17
118	1	124	7
120	18	130	10
124	5	134	2
128	1	140	4
130	1		
	90		91=181

Average maximum of pulse in Males =107·5.
" " Females=114·1.
" " Males and Females=110·8.

The five cases in which the pulse is marked 86, were admitted on the seventh, ninth, eleventh, fourteenth, and twenty-first days of the disease, so that it is probable that partial convalescence had commenced at the time the pulse was noted.

Every case below twenty years of age has been excluded, because the maximum of the pulse varies more from childhood to adolescence than during any other similar period of life; and those who died have also been excluded, as the comparison between the pulse and the recovery would not be uniform in the two diseases, and as the average maximum of the pulse of those cases which terminated fatally was greater than that of those who recovered.

This table shows, that in 181 cases of eruptive typhus occurring in adults, the maximum frequency of the pulse was not below 96, except in five cases; that in about three-fourths it was 108, and upwards; and that the average maximum of the whole was 110·8.]

As the disease advances [or, about the third week], the pulse becomes more feeble, the tongue darker, more dry and often retracted, the complexion more dingy, the prostration excessive and often attended with tremor of the hands and starting of the tendons at the wrists, the stupor deeper and less interrupted by delirium, the evacuations involuntary, or the fecal discharges involuntary, with retention of urine and distension of the bladder. Where the event is unfavourable, death is preceded for one or two days by increased frequency and a jarring state of the pulse, hurried, interrupted breathing, hippocratic expression of the countenance, much injection of the conjunctivæ, increased subsultus of the tendons, twitches of the muscles of the face, singultus and deep coma. Where, on the contrary, recovery is to take place, the tongue becomes moist and cleaner on the edge, the pulse more full and less jarring, the delirium milder and more broken by natural sleep, the stupor less profound, so that the patient is more easily roused, the expression that of drowsiness rather than of oppression; and frequently these favourable signs are attended with increased sensibility to the natural appetites, so that drink is asked for, and sometimes food also. These changes are very generally followed by progressive amelioration; which, however, is always gradual and slow.

Fatal cases, where not resulting from sudden syncope early in the disease, most generally terminate between the eleventh and seventeenth days, very seldom sooner, and not often later, except through the intervention of secondary diseases. Amendment, or what is usually termed the "turn," or crisis of typhus, also commonly occurs between the eleventh and seventeenth days, most generally about the fourteenth. But sometimes the disease goes

on much longer, and with very little alteration in the nature or degree of the symptoms; and instances at times occur of mild typhus continuing unabated for six weeks.

[The duration of typhus is irregular, varying with each epidemic and in individuals; it ranges from five to thirty days. It generally runs its course in from one to six weeks. A great degree of uncertainty exists in the evidence obtained from hospitals, from the unsatisfactory answers received from patients, as to the period when the disease commenced, as well as from the discrepancy which arises in the different methods of calculation adopted by physicians. Some regard the disease as terminated on the commencement of the convalescent stage; while others include the whole period of the patient's residence in the hospital as its duration. Another difficulty arises from their not classifying patients according to their ages, and the degree of severity of the disease. The disorder is of less duration in young persons than in adults, and in mild than severe cases. Dr. Stoker states that of four hundred and seventy-one cases, mostly mild, nearly three-fourths terminated on or before the seventh day. Dr. Pickels found it rarely to exceed the eleventh or thirteenth day, and in many cases to be much shorter; and Dr. E. Percival says fatal cases terminated between the eleventh and seventeenth days. Dr. Bracken asserts, that in the epidemic of 1817, 1818, and 1819, the greatest number of deaths took place on the ninth day; and then, successively, on the tenth, twelfth, eleventh, seventh and eighth. These writers do not, however, inform us in what manner they estimated the duration of the disease. Dr. Mateer, of Belfast, makes the average duration of typhus much greater; he found of 11,209 patients treated during a series of nearly twenty years in the Belfast hospital, that the average period, during which the patients remained in the hospital, was about twenty-two days, and that they had, on an average, been ill about seven days before being brought in. This would give a mean duration of twenty-nine days. The termination fixed on was not the crisis or commencement of convalescence, but the complete restoration of health. Had the first period been taken, the fourteenth day would be the time at which the point of intensity was reached. According to Dr. Alexander P. Stewart, the mean duration of typhus fever at Glasgow, calculated from the results of many thousand cases, during successive years, was twenty-one days.* Dr. Henderson says, that the average day on which convalescence commenced at the Royal Infirmary of Edinburgh, in 1838, 1839, was the thirteenth. The average period at which death took place, calculated from forty-three cases, was between the twelfth and thirteenth days.† Dr. Arthur Thompson states, that the average duration of 2630

* [Ed. Med. and Surg. Journ., Oct., 1840. † Ib., Oct., 1839.]

cases was twenty-seven days; and this calculation was made from cases described and enumerated in the works and papers of Drs. Bateman, S. Smith, Latham, and Craigie.]*

Authors have described a variety of phenomena which may present themselves at the time of crisis, and which appear to be connected somehow with the favourable change, such as spontaneous diarrhœa, bleeding from the nose, a profuse discharge of highly loaded urine, and, above all, perspiration. [Dr. Bartels has detailed three cases in which the appearance of sores upon the tongue was regarded as critical in the course of typhus fever, no mercury having been given.]† There is no question that such "critical evacuations" do at times occur in typhus. But their frequency has been much overrated. Probably here, as in many other respects, important differences present themselves in different epidemics; and of late, assuredly, it has been rare that any increased natural discharge, or any preternatural evacuation, has been observed to accompany the crisis of fever.

[Many writers assert that the commencement of convalescence in typhus is distinctly marked, that it is preceded by certain phenomena of a decided character; a sort of struggle between the suffering economy and the diseased action. Dr. Stewart, of Glasgow, says: "All that I insist upon is the frequent, I may say, the common occurrence of a perceptible crisis, or what is vulgarly termed *a turn*, in typhus. I think I may appeal to the experience of every physician, and more especially of every resident clerk in a fever hospital, for they have more constant opportunities of observation, whether they have not often been struck at seeing, during their morning visit, the glassy eye, the haggard features, the low, muttering delirium, the stupor approaching to coma, the tremor, the subsultus, the carphology, the rapid, thready, tremulous, and intermittent pulse, of the previous evening; the formidable array of symptoms, in short, which seemed to indicate a speedy and fatal termination, exchanged for the clear eye, the intelligent countenance, the steady hand, the comparatively slow and firm pulse, and the returning appetite of approaching convalescence. To such cases as these we might almost apply the Scripture phrase, 'At such an *hour*, the fever left him;' and if the crisis is not *very* frequently so marked, we can, in the great majority of cases, point with precision at least to the *day* on which amendment began to take place."‡ Hildenbrand insists that the patient is generally able to determine the degree of relief afforded by these critical evacuations; or, that he, at least, can distinguish those of a salutary nature. He moreover asserts that the relief is immediate

* [Edinburgh Med. and Surg. Journ., July, 1838.]
† [Allgem. Med. Centr. Zeitung, 11 and 14 Jan., 1843.]
‡ [Edinburgh Med. and Surg. Journal, Oct., 1840.]

and striking. The urine, he conceives, deserves less consideration than any other critical evacuation.]

Favourable cases show a decided tendency to terminate upon what are called critical days. This fact has been generally denied in modern times; but close observation has shown that the ancient physicians were correct in admitting the doctrine of critical days. [Decisive crisis, when the disease is mild and regular, generally takes place, Hildenbrand states, about the fourteenth day, and very rarely on the seventh. Dr. Mateer says, "the point, commonly termed crisis, occurs at some fixed time. In one hundred consecutive cases, carefully noted for this purpose, it was found, on a mean calculation, that the fourteenth day was that on which this crisis took place.*] Such is the result of the only extended series of observations recently made, those of Dr. Welsh in the Edinburgh epidemic of 1819. The critical days are 3, 5, 7, 9, 11, 14, 17, 20; the non-critical are the intermediate days; but 4 and 6 are considered secondarily critical. The following table, constructed from 630 cases, where the commencement and termination of fever could be fixed with tolerable precision, certainly presents a remarkable correspondence with the ancient doctrine.

Days.			Days.		
Crit.	Non-crit.	Cases.	Crit.	Non-crit.	Cases.
3	- -	6	14	- -	63
4*	4*	18		15	10
5	- -	80		16	11
6*	6*	34	17	- -	34
7	- -	129		18	2
	8	26		19	4
9	- -	80	20	- -	0
	10	17		21	15
11	- -	69		22	3
	12	80		23	0
	13	15			

Hence of 690 cases, crisis took place in 470 on critical days, in 52 on the subsidiary critical days, and in only 108 on the days which are considered non-critical. It must be observed that these data are founded on cases of the three types of fever taken promiscuously, and at a time when synocha and synochus were common.

[Another and more recent observer, Dr. Davidson, has published his researches on this subject, which are unfavourable to the doctrine of critical days.

* [Ed. Med. and Surg. Journ., Oct., 1840.]

Table showing the Day of the Disease on which complete Convalescence was established in 181 *Cases of Eruptive Typhus.*

Males.		Females.	
Day of Disease.	Number of Cases.	Day of Disease.	Number of Cases.
12th	1	13th	2
13	4	14	7
14	2	15	11
15	9	16	3
16	9	17	9
17	9	18	10
18	6	19	6
19	7	20	10
20	3	21	3
21	10	22	5
22	8	23	2
23	2	24	3
24	6	25	1
25	2	27	4
26	4	28	1
27	4	29	3
28	1	30	2
29	3	32	1
		34	4
		36	1
		44	1
		54	2
	90		91=181 tot.

Average convalescence in Males =19·7 days.*
" " Females=21·3 days.
" " days in Males and Females=20·5.

This table shows that only one case of typhus was convalescent on the 12th and six on the 13th day of the disease, out of 181; and that the average convalescence of the whole was 20·5 days.]

The blood in typhus puts on a different appearance from what is observed in synocha. It is not bright, but on the contrary very dark, flows sluggishly from the vein, coagulates loosely, and seldom shows any appearance of a buffy coat. These characters become more and more marked as the disease advances: and in the latter stages of bad cases the blood coagulates so loosely, as to be tremulous, brittle, and almost to resemble ill-made currant jelly. It also alters materially its chemical constitution, becoming

* [Dr. Henderson states that he has seen instances of convalescence on the seventh and eighth days, in which the eruption had existed; but it is not mentioned at what stage of convalescence the calculation was made, and what were the ages of the patients.—*Edin. Med. and Surg. Journal,* Oct. 1839, p. 430.]

much poorer in all its solid contents, but especially in colouring matter and saline materials. The analytic researches of Dr. CLANNY show that the salts and hæmatosin are often reduced to two-thirds of the healthy proportion.

[Dr. GERHARD describes the blood in the epidemic of Philadelphia in 1836, as being at a very early period, dark, without the buffy coat, and offering a large, but soft and dark-coloured coagulum. At a more advanced stage, it presented in some patients the dissolved appearance, described by various authors as characteristic of typhus or putrid fevers. Dr. O'BRIEN says "that in those instances where blood was taken in the advanced period of the disease, he always found its texture broken down and dissolved, changing rapidly into a greenish, watery fluid, with little coagulum, indicating great dissolution of the animal fluids." HUXHAM has described the altered state of the blood in typhus. Analytical details will be given in the section on typhoid fever.]

II. SECONDARY AFFECTIONS IN CONTINUED FEVER.

Such are the symptoms, more or less essential, of the three great forms of primary continued fever. They are subject to great variety, owing to the various degrees in which the inflammatory and typhoid characters are combined. But they are also subject to still greater variations from the concurrence of secondary affections. It is in fact rare to observe a case of fever, whether typhoid or inflammatory, but more especially the former, run through its entire course without some incidental or secondary disorder making its appearance.

[Dr. ARTHUR THOMPSON gives the following table of the complications of fever from cases related by Drs. SMITH, TWEEDIE, ALISON and CRAIGIE, and it shows that the complicated varieties are much more numerous than the simple or uncomplicated:

Simple Fever,		374
Fever with Cerebral Complications,		375
Thoracic	do	264
Abdominal	do	180
Mixed	do	308
		1501]

Cases of pure unmixed primary fever do not occur quite often enough, as formerly stated, to satisfy every attentive observer that such a thing as primary fever has real existence; but still cases of complication are infinitely more common; and they are proportionally most common where the fever lasts for some time, and where a disposition is manifested towards the typhoid form. They are proved to be secondary, and not essential to the fever,

because they present a great variety in their seat and nature; because they are sometimes all absent; because they very seldom make their appearance till the fever has subsisted for several days; and because they both appear and disappear without the course of the fever being thereby materially altered in any essential symptom. They seem to depend for their origin on certain local infirmities of constitution, or on the body having been exposed to some of the ordinary causes of local disorders about the period of invasion of the fever; and the direct pathological state which induces them is, in all probability, congestion of vessels in the part attacked—a state which exists more or less throughout the internal organs generally, and which is developed by co-operating influences into more positive local disease. In very many cases, however, it is impossible to point out satisfactorily the co-operating cause; and for the most part, much is left to be ascribed to obscure peculiarities of season, terrestrial locality, or epidemic constitution. These peculiarities are in some circumstances observed to be so comprehensive in their operation, as to impart a peculiar character to an entire epidemic of fever. And from such occurrences it is—from certain local disorders occurring with great frequency on certain times and in certain places—that many physicians have been impressed with the notion that the fever was not primary in its nature, but in reality secondary to the local affection.

There is scarcely any end to the number of local disorders which may occur incidentally during fever. Most of them partake of the nature of local inflammation. The secondary symptoms to which they give rise may be conveniently arranged according as the seat of disease is in the head, throat, chest, abdomen, or skin.

1. Affections of the Head. — The incidental affections referable to the *head* are chiefly congestion in the brain or its membranes, meningitis, and a convulsive affection allied to epilepsy.

In all cases of typhus and in the advanced stage of synochus, it seems probable that there is a tendency to a *congested state of vessels* in the whole internal organs, especially, perhaps, in those of a membranous structure, and among the rest in the *brain and its membranes.* This appears probable from the state of all the membranous surfaces visible from without; such as the skin, the conjunctivæ, the Schneiderian membrane, and the lining membrane of the mouth and throat, which are all of them often seen to be dark and unusually vascular. It is scarcely correct to consider this state as secondary, or at least an incidental affection. It is probably the consequence of the depressed state of the nervous system, which has been already often insisted on as one

of the essential circumstances of primary fever. It lies in the ordinary course of events; it is secondary in one sense, in so far as it is consecutive; but it is not incidental. In some cases, however, congestion of the brain is so great in degree and so prominent in its symptoms, as to become a highly important local affection; and in this sense it deserves mention in the present place, while passing from the essential symptoms of primary fever to the more purely secondary disorders. The symptoms of inordinate congestion in the brain and cerebral membranes, are dingy redness and heat of the face, as well as heat over the integuments of the head, dark and minute injection of the conjunctivæ of the eyes, an extreme degree of stupor, aggravated muttering delirium, great feebleness and increased frequency of the pulse, irregular distribution of temperature in the extremities, a dark, dry tongue, which cannot be protruded—all the symptoms, in short, of the most highly developed state of typhus. This is the most frequent cause or manner of death from continued fever in the British Islands, as well as in many other countries. On some occasions the symptoms of cerebral congestion show themselves at so early a period in the disease, and so generally, as to impart a peculiar character to the epidemic, and to have led some to describe such a fever under the distinguishing name of *Congestive Typhus.* But it is probable that all cases of true typhus are attended more or less with this affection.

The frequent occurrence of cerebral congestion, and the similarity of its symptoms and morbid appearances to those of certain forms of cerebral inflammation, have led some pathologists, with Dr. Clutterbuck at their head, to imagine that fever is essentially a *Meningitis.* This is undoubtedly a mistake, and it was clearly a happy conception, for which medicine is mainly indebted to the late Dr. Armstrong, to characterize the local derangement as congestion. True meningitis is a very rare affection, as secondary or incidental to continued fever. There are at least few apparent cases of it, which may not be as correctly referred by the symptoms to congestion. And, indeed, where the symptoms are characteristic, and the diagnosis during life is shown to have been justified by unequivocal appearances after death, it generally admits of question, whether the disease ever truly was continued fever, or anything else than a primary local inflammation. It is a strong proof of the reasonableness of this question, that unequivocal meningitis is exceedingly rare, where alone there can be no doubt of the fever being primary, in cases of fever clearly referable to infection. In one shape meningitis has been thought by some to be not uncommon in fever. In persons at or beyond the middle term of life, who have been long addicted to intemperance, the symptoms often put on a very aggravated character from an early period, being compounded, as it were, of those of

congestive typhus and delirium tremens. The delirium comes on earlier than usual, and is intense; there are great tremor of the hands, a highly flushed state of the countenance, and much injection of the conjunctivæ; coma supervenes speedily; and intercurrent convulsions are not uncommon. In such cases, which for the most part terminate fatally, unusual injection of vessels is found in the membranes of the brain, and likewise an unusual amount of effusion of serosity in the sub-arachnoid cellular tissue, as well as in the ventricles and base of the brain. These phenomena, however, present nothing which may not be referred with equal or greater propriety to congestion; they are the symptoms and anatomical characters of congestion in its most aggravated degree. Meningitis, it is true, is indicated by symptoms closely similar; and, when fatal in the early stage, may present no other appearance after death but congestion or serous effusion. Still this fact will not entitle the pathologist to assume that congestion becomes inflammation in the cases in question. There is nothing in the phenomena during life to warrant such a doctrine; the effects of remedies in particular furnish no corroboration; and anatomical evidence is wanting, so long as there are not found, what is undoubtedly very rarely found in true continued fever, occasionally instances of effusion of lymph, or at least capillary vascularity, without gorging of the larger vessels and sinuses.

It has been justly observed, that in some cases of bad congestive typhus, occurring especially in drunkards, intercurrent convulsions are apt to present themselves. But a *Convulsive affection*, allied to epilepsy in its characters, also occurs at times, independently of the constitution of intemperance, and even of any marked degree of congestion in the brain. It is a rare incidental disorder. It is perhaps always fatal. It appears most generally towards the middle or close of the second week, but sometimes so early as before the termination of the first. It is occasionally preceded by drowsiness and an unusual degree of headache for a day or two; but more commonly the patient is seized on a sudden with coma, convulsions of the trunk, extremities, and face, copious perspiration, hurried convulsive breathing, a rapid, excessively jarring, but easily compressible pulse; and death ensues in the course of one, two, or at most six hours. No appearance is ever found within the head to serve as an explanation of this remarkable incidental disorder; but the writer may mention, that in every case which has come under his notice since the publication of Dr. Bright's hospital reports, the kidneys have been found more or less affected by the granular degeneration, which he was the first to indicate with precision. It must be farther observed, that, where this organic derangement of the kidneys subsists, death sometimes takes place from convulsions, preceded for a few days by an affection, not unlike mild typhus;

and that such cases are accordingly apt to be confounded with continued fever.

2. Affections of the Throat.—The incidental affections referable to the *throat* are chiefly *cynanche tonsillaris*, *aphthous ulceration* of the throat and mouth, *cynanche laryngea*, and *cynanche parotidæa*. These disorders, with the exception of cynanche parotidæa, appear most frequently during the harsh irregular weather which precedes in this climate the approach of winter, and follows its departure, more especially during the prevalence of northerly winds. They are often the source of much annoyance to the patient; but they are seldom in themselves the source of danger—the whole of them, not excepting even cynanche laryngea, having a tendency to become resolved in the progress of the fever, and being for the most part amenable to treatment. It seems unnecessary to dwell on the special symptoms of these local disorders. Cynanche parotidæa, so far from being any sign of danger, is not unfrequently a concomitant of the crisis or turn of fever; and, from a remote period, has, therefore, been commonly held by nosologists to be an auspicious sign in circumstances otherwise favourable. It is not, however, so invariably auspicious as many imagine; it is often, too, the source of great distress; and, in severe fever, it is prone to run on to suppuration, especially in unsound constitutions.

3. Affections of the Chest.—Next to congestion of the brain and its membranes, there is no class of incidental diseases more important than those referable to the *chest*. In the British Islands, and above all, perhaps, in Edinburgh, they are the most frequent of all secondary affections; so that, amidst the tendency of modern pathologists to the doctrines of Non-essentialism, it is rather remarkable that no one has taken up with the chest as his hobby, for seating the local cause of fever.

Catarrh, indicated by cough, at first dry, afterwards with clear mucous sputa, and by mucous murmur attending respiration, is an exceedingly common accompaniment; and sometimes, at particular seasons, scarcely a single case occurs in hospital practice without more or less of it. It often occurs very early in the fever, sooner perhaps than any other incidental affection; and hence the patient is sometimes at first deceived, and his attendant puzzled, as to the real nature of his attack. But for the most part it is secondary in point of importance; frequently it disappears in a few days under mild treatment; seldom does it influence materially the course of the fever; and very rarely is any risk run from its usual termination is cases of idiopathic catarrh—mucous gorging of the bronchial tubes. This incidental disorder must be distinguished from one which considerably resembles it in the symptoms, but which arises from a different cause and at a different

period of fever. In the advanced stage of typhus or synochus, especially where the cerebral oppression is considerable, patients are very subject to a short, hacking cough, the exertion for which in their exhausted condition causes much general distress and uneasiness, and may even induce them to complain of pain when questioned on the subject. As there is usually in this state short hurried breathing, the result of mere debility, and sometimes also a little clear mucous expectoration, the symptoms may lead to a suspicion of catarrh or obscure pneumonia being present; and the inexperienced are apt to commit this error in diagnosis, and to treat the affection unnecessarily and injuriously as of the nature of inflammation. From pneumonia it may be distinguished by the patient being able to take a full breath without uneasiness, by the clearness of the chest everywhere on percussion, and by the stethoscope indicating merely a slight, dry mucous murmur at the extremity of inspiration chiefly. From proper catarrh it is principally distinguished by the period of its occurrence in the course of the fever, and by the inconsiderable expectoration which attends the cough, even where it has lasted several days. This affection passes off promptly after the fever takes a favourable turn, and without the aid of any express remedies. The rationale of it seems to be, that the pulmonary circulation partakes of the congestive disorder of the capillary circulation at large; and that the cough arises from the irritation of the injected mucous membrane, or obstruction of the passage of blood through the vascular system of the air-cells. It may be conveniently distinguished by the name of *Congestive Catarrh.* In the latter stage of fatal cases of typhus or synochus, the affection becomes accompanied with serous effusion, especially in the depending portion of the lungs, where it is seen after death, and where during life it is indicated by the stethoscopic sign of crepitation.

Pneumonia and *pleurisy* are on the whole rare local affections in the course of fever; yet they are sometimes unequivocally developed, and for the most part under the co-operation of obvious exposures. They are most frequent in the latter stage of all the three forms of fever; and in that case they are apt to continue after the primary fever subsides, and to run their own proper course. When they occur at an early stage of the fever again, they are in general subdued with little difficulty, if discovered in time; and then the fever may continue its course uncomplicated. Both pleurisy and pneumonia are sometimes met with in the early stage of convalescence, as the result of undue exposure to atmospherical vicissitudes. It may be also observed of either, but especially of pleurisy, that where it appears to originate during fever or convalescence, the inflammatory disorder is sometimes found, on careful inquiry, to have existed in an obscure form for some time before the invasion of the fever. It is unne-

cessary to detail the particular symptoms of these two diseases when secondary to fever, because they present no peculiarities in the febrile state. The only circumstance requiring consideration is, that the torpor of the senses and mental faculties may render the patient unaware of his condition, or incapable of complaining of it; and that the practitioner, wherever either is suspected to exist, must attend more to the sputa, to the sounds elicited by percussion, and to the indications of the stethoscope, than to any other information, such as may be obtained by questions. There appear to be some epidemics of fever, where pneumonic inflammation is exceedingly prevalent as a secondary disease, insomuch as almost to form the epidemic character of the fever, and to be a common immediate cause of death. No epidemic of this kind has been observed of late years, especially since the improvements introduced into the diagnosis of pneumonia by the discoveries of Laennec; and the chief observations on the subject were made a considerable number of years ago. It is not improbable that the supposed pneumonia was nothing else than the congestive affection of the lungs, described under the head of *Catarrh.*

[This complication is very common in many parts of the United States, especially during the winter months; it may, indeed, be said to be endemic in certain localities. It is generally known as *Pneumonia Typhoides.* This form constituted the great winter epidemic of 1812–13; and was regarded, by the best authorities, as distinct from the *Spotted Fever*, before alluded to (p. 103), and which prevailed in the northern districts of the Eastern States.]*

4. Affections of the Abdomen.—The secondary affections of the abdomen which occur during continued fever, are some of them objects of extraordinary interest in the present day; to all, on account of their great frequency; and to not a few, as supplying, in their opinion, evidence against the non-essentiality of fever. There is scarcely any organ in the abdomen which is not at times affected during fever in such a way as to constitute an incidental or secondary affection. But the most important disorders are an obscure affection of the stomach, of the nature of inflammation or irritation—swelling and subsequent ulceration of the muciparous glands of the intestines, constituting the dothinenteritis of late pathologists—and derangement of the hepatic organs, attended with the external symptoms of jaundice.

A common accompaniment of continued fever is an obscure disorder of the stomach, allied to *Gastritis.* In this country we frequently meet with cases where the patient is affected, particularly towards the close of the first and beginning of the second week, with severe sickness, frequent vomiting, tenderness in the

* [See Williams & Clymer on Diseases of the Respiratory Organs. Philadelphia, 1845, pp. 177—182.]

epigastrium, or positive pain increased by pressure. These symptoms, which are more frequent in other countries, and especially in France, have been assumed to depend on inflammation in the mucous membrane of the stomach; while others ascribe them with greater probability to mere irritation only, connected, it is likely, with a congested state of the organ, or to a mere functional disturbance depending on depressed action of the brain. According to a late fashionable doctrine, that of Broussais, who has still his followers in many places, this local affection is a real inflammation, always present, more or less, and not merely an accompaniment, but likewise, in connection with a similar disorder of the intestines, the essential cause of all continued fevers. There are now comparatively few who adhere to this doctrine in its full extent; in Britain its admirers were never distinguished either by their number or by their eminence; and certainly it would have been odd, had many converts been found among those who have faithfully observed on the great scale the phenomena of the British epidemic fevers. The symptoms in question are frequently absent altogether; and when present, if they are to be regarded as evidence of inflammation, all that need be said is, that, for so formidable a disease as inflammation of the mucous membrane of the stomach, the symptoms are wonderfully easy to subdue, since they seldom resist a few leeches or a blister. At times, however, the affection is severe, the nausea being excessive, the vomiting frequent and constantly excited by drinks or medicine, and the tenderness and tension very distressing. It is not easy to pronounce what the nature of this affection may be in such cases; but, as happens in milder instances of the like kind, it is for the most part easily subdued by gentle antiphlogistics; and, except the relief given to local suffering, no manifest change takes place in the phenomena of the fever. Such are the results of British experience on this much agitated topic.

In other instances of fever it is supposed that the mucous membrane of the intestines may be similarly affected, giving rise to a secondary *Enteritis*. In some cases, even in this country, there are observed in the progress of fever distension and firmness of the abdomen, tenderness or positive pain, with an anxious countenance, and either constipation or diarrhœa. But abroad, and above all, it appears, in France, such cases are very frequent, and for the most part severe. Two affections have been indicated, one consisting probably of irritation, possibly of incipient and mild inflammation, of the intestinal mucous membrane generally; the other, a far more formidable disorder, consisting of inflammation, suppuration, and eventually ulceration of the solitary and conglomerate glands of the intestines, in concurrence generally with enlargement and sometimes suppuration of the mesenteric glands. These two affections, along with the supposed variety of gastritis just described, are thought by many to be invariably present in

continued fever, as it shows itself in France, and are believed conjunctly to be the true cause of fever. The latter intestinal disease, in consequence of the recent researches of Bretonneau and Louis, is believed by many to be invariable in typhus; and the anatomical lesions connected with it are believed to constitute the essential cause of anatomical character of typhoid fever. Both affections are undoubtedly met with in the fever of this country. Much more frequently, however, both are absent; and the common rule is, that a case of fever passes through all stages of the disease, without any symptom whatever referable to a disorder in the bowels, except some flatulent distension, vague uneasiness rather than absolute pain, and constipation. But in particular diarrhœa, the most invariable symptom, both of the milder and of the more severe disorder, is comparatively a rare incident, at all events far less common than the very opposite condition.

It is not easy to distinguish the two affections of the bowels by their symptoms; for in both of them there are fullness and tension of the abdomen; frequently, though not always, tenderness; sometimes griping pain; and very generally a frequent, watery, yellow diarrhœa. That such secondary symptoms must in general arise in the continued fevers of this country from nothing more than irritation, or at most a low state of incipient inflammation of the intestinal mucous membrane, would seem sufficiently obvious from the simple fact that they are, for the most part, very easily checked, or that, where they do continue for some time unsubdued, they seldom add much to the exhaustion occasioned by the fever, and eventually disappear of themselves, either by degrees before the fever ceases, or more promptly after a crisis takes place. They are certainly, in by much the greater proportion of cases, regarded by British practitioners without alarm; and not unfrequently a mild yellowish diarrhœa seems even to keep down the force of febrile action in cases of synochus ushered in by a sharp inflammatory stage, and cannot be altogether arrested without apparent injury from aggravation of the general fever.

The occurrence of *Dothinenteritis* is a very different incident. This very interesting disease, which, as formerly stated, seems to have been first observed in 1762 by Roederer and Wagler, and again in 1813 by Petit and Serres, has of late years attracted much attention, especially in France, since the investigations of Bretonneau into its anatomical characters, and the elaborate and precise inquiries of M. Louis into its relations to fever. The latter eminent pathologist concludes, as the result of his researches, that it is never wanting in true typhus, and is the local cause of that variety of fever—an opinion in which he is followed by many.*

* [We have already shown (p. 54), that nowhere does Dr. Louis maintain such causation.]

There can be no question, however, either that dothinenteritis is merely an occasional, incidental, or secondary affection during fever; or that it is a wholly different disease from that to which the name of typhus has been long appropriated in this and other countries. For the invariable experience of British practitioners extensively conversant with the features of typhus is, that enlargement of the glands of Peyer and Brunner, situated in the inner membrane of the intestines, is a rare, and in many parts of Britain, a very rare occurrence. M. Louis, as formerly mentioned, is now inclined to think that the two diseases are essentially different. Such may well be the case. All that British pathologists can reasonably hold out for is, that the dothinenteritic affection shall be admitted to present itself at times as secondary to typhus, since in Britain it occurs only occasionally during epidemics of typhus, and the cases where it is seen, originate, as clearly as other cases of typhus, in infection. The term typhus, or "typhoid affection," ought not to be appropriated, as M. Louis desires, to this local affection—to this newly-discovered disease—which is far more frequently absent than present in what used to be called typhus. No one, however, will deny that the local disease, secondary in one circumstance, may become primary in another, and even present itself as such in the epidemic form. In short, let the name originally proposed by Bretonneau* be retained as simply describing its anatomical character (δοθιὴν, a pimple, and ἔντερον, the intestine), and it may be granted that, like catarrh, pneumon,a, and other inflammatory local disorders, dothinenteritis may both occur as a primary disease, and also as secondary to typhoid fever.

As a farther illustration of the secondary character of this affection in Britain, it may be observed, that instances of it are not only far more uncommon here than in France, but likewise that their frequency seems to differ much in different quarters of this kingdom. From the accounts lately published of epidemic fever in London, Manchester, and Edinburgh, for example, the disease would appear to be decidedly most frequent in London, and least frequent in Edinburgh. In Edinburgh it is unquestionably a rare concomitant of fever. In the infirmary it has been constantly and diligently looked for during the last sixteen years in several epidemics; yet it is found only often enough to make the pathologist acquainted with its phenomena, and keep him in mind of its existence. On one occasion only, during the latter months of 1829, when a dysenteric tendency showed itself to an unusual degree in the population generally, and, above all, in the hospital, has it been observed to constitute an appreciable proportion of the fever cases.

[* *Dothinentèrie*, and not *Dothinenteritis*, was the name originally proposed by Dr. Bretonneau, (p. 54)].

[On this point, Dr. WATSON says: "Since attention has been drawn to the subject, the patches of glands, and the whole tract of mucous membrane, from the stomach to the rectum, have been diligently explored; and the result seems to be that, at certain times and places (in other words, in certain epidemics), the ulceration of the inner surface of the intestines is far less common than in others. It was comparatively rare in an epidemic of which I witnessed some part in Edinburgh. Then I came to London, and, for several years, I never saw a body opened after death by continued fever without finding ulcers in the intestines. Still, in my own experience, such ulcers have been vastly more often present than absent." (*Lectures on Practice of Physic.*)]

The symptoms of dothinenteritis are sometimes obscure; and, if the affection be not fully formed before the fever has advanced far, the typhoid oppression renders them very indistinct, so that no farther indications are perceptible than the equivocal signs, flatulent distension, uneasiness on pressure, and yellow diarrhœa. When its external characters are well-developed, there are, in addition, general tenderness or pain, felt especially on pressure in the right iliac region, short hurried breathing, commonly a red, dry, chapped tongue, and sometimes vomiting—an important sign when it occurs late in typhus. It is commonly attended at an early period, and almost always sooner or later, with a profound state of typhoid oppression. If we are to grant to M. LOUIS and his countrymen, that it may occur as a primary idiopathic disease,* we must also concede, that its symptomatic fever is peculiarly typhoid, undistinguishable by any essential characters from the true primary typhus of British pathologists. Its course is very frequently unfavourable, and death seems in general owing, not as in dysentery, to exhaustion, but to gradual aggravation of the typhoid state. In a few instances, however, it terminates in intestinal perforation, indicated by sudden acute pain in the right iliac region, spreading, burning pain over the abdomen, sickness and vomiting, hippocratic expression, dreadful anxiety and extreme exhaustion, followed by death in the course of from eighteen to thirty-six hours. A remarkable proof of the profound nature of the typhoid coma which attends the disease is, that sometimes even perforation and consequent peritoneal inflammation take place, as shown by dissection, without any particular signs of the event having been observed during life. In favourable cases recovery is commonly slow, provided the symptoms of the local affection be well-marked, for the patient has to pass through the slow process of restoration of the healthy state of the intestines from suppuration or ulceration. Nevertheless it is seldom, at least in this country, that he does not eventually overcome the disease, should he not sink under the typhoid depression of the

* [A concession never asked by Dr. LOUIS, and most of his countrymen.]

nervous system in the early stage. [See chapter on Typhoid Fever by the Editor.]

The only other important abdominal affection of a secondary nature which requires mention, is *disorder of the hepatic system*, accompanied with jaundice. This is a rare complication, occurring chiefly in the autumn months, and principally in those epidemics where the inflammatory type is prevalent. Yet it is important, because cases where it occurs commonly prove fatal. The exact nature of the affection is not apparent. The symptoms are, rapidly formed jaundice, sickness with frequent vomiting, but without particular uneasiness in the region of the liver, extreme prostration of strength, much tendency to coma at an early period of the fever, speedy sinking of the pulse, and, in general, bilious stools. The symptoms show themselves in the course of the first week. If they do not begin to abate in two or three days, death occurs in a few days more, under a state of extreme exhaustion and deep coma. Should the yellowness of the skin, however, begin to diminish, the other secondary symptoms soon subside also, and the fever runs its usual course. Some have imagined this affection to be allied in nature to the yellow fever of hot countries, but with what justice it is not very easy to say.

[In the account of the Epidemic Fever in Scotland, in 1843, it was mentioned that the cerebral disorder which had been referred to jaundice, was, in reality, due to the presence of urea in the blood (p. 92). How far this may be true in other fevers, it is impossible to say. In a case of typhus exhibiting analogous cerebral symptoms, with diminution of the urinary secretion, urea was detected in the blood by Mr. M. W. Taylor. (*Scottish Med. Gaz.*, vol. i. p. 289. Ed. 1843.)]

5. Affections of the Skin.—The affections of the *skin*, which occur as secondary to continued fever, are of much importance, not merely on account of the danger attending some of them, but likewise because they often singularly aid the physician in forming his prognosis. The chief affections requiring mention are, the various forms of *petechiæ*, an eruption analogous to *measles*, *vibices*, *miliaria*, *sloughing*, and *erysipelas*.

Petechiæ of one kind or another are so common in some epidemics of fever, that it is rare to find a case without more or less of them. They often escape notice, it is true, because they are not expressly looked for in the quarters where they may most generally be found. At the same time there is no ground for the notion lately entertained by some, that in real infectious fever, or, as stated by others, in true typhus, petechiæ are never entirely wanting. This notion has clearly arisen from partial observation, confined to particular epidemics. Extended observation in many epidemics leads to the conclusion, that in continued fever of all

types petechiæ are not essential, but secondary. Three kinds of eruptions have often been comprised under the generic term petechiæ:—1. One, which is exceedingly rare, but which is occasionally remarked in the advanced stage of bad synochus or typhus for a short time before death, consists of small, pale brown, lenticular spots, without any elevation or roughness of the skin, and much resembling freckles. 2. Another, which is very common in some epidemics, and especially where the early stage of fever presents the inflammatory character, forms small, dark, reddish-black, roundish, accurately circumscribed, and often closely crowded spots, without elevation of the skin, and much resembling fleabites. Their resemblance to fleabites is such, that on the one hand, the latter are often mistaken for petechiæ; while, on the other hand, some physicians will insist that real petechiæ are nothing else but fleabites. The two appearances, however, cannot be mistaken by a careful observer, because the petechial spot does not present the little dark point in the centre, which may be invariably seen in the fleabite, either with the naked eye, or with the help of a common magnifier. Sometimes the petechiæ are few in number, and readily escape notice; in other instances, on the contrary, they are excessively crowded. Their usual seat is upon the breast, shoulders, forearms, and legs; but they may be seen also on all other parts of the body except the face. They generally make their appearance towards the close of the first or beginning of the second week, and certainly not on a specific day, like the eruptions of the febrile exanthemata, as some have maintained. They are observed to occur chiefly in severe cases, but, from frequent observation in the epidemics of Edinburgh, they do not necessarily indicate danger; on the contrary, the cases in which they appear have proved rarely fatal. The appearance is owing to a thin stratum of extravasation on the surface of the true skin, and appears connected with increased force of the circulating system, being most characteristic where reaction is high. This form of petechial eruption has become rare (1838) for a few years past. 3. The third variety presents more or less numerous spots, of a paler, rather lake-red or rose-red tint, irregular in shape, not distinctly circumscribed, but rather diffuse round the edge, with sufficient elevation of the skin to impart a sense of roughness to the finger, when drawn over a part where they are numerous. They present some resemblance to measles; and at times are so like that eruption, that the other symptoms must be looked to for the diagnosis. They present the same variety in number with the dark circumscribed petechiæ; they are usually most abundant over the chest, shoulders, forearms, legs, loins, flanks, and abdomen; and they are not unfrequently found loosely scattered round the loins, flanks, and upper part of the belly, although not visible anywhere else, so that, if not sought for, they may

escape notice altogether. Different accounts have been given of the usual time of the appearance of this form of petechiæ. In the epidemics of Edinburgh it appears about the seventh day, for the most part, sometimes a day or two later or earlier. Elsewhere it is stated to occur very regularly on the fourth day; at least, some have described a measly-like eruption, which appears to come under the present head, and which is said to break out so regularly on a particular day, and that day the fourth of the fever, as to have warranted in some measure the conclusion, that the disease was a variety of continued fever, assuming the general habitudes of the eruptive fevers. The diffuse pale petechiæ occur almost entirely in epidemics and cases of the typhoid type. It is, perhaps, invariably associated with a severe attack; and cases where it appears often prove fatal. According to M. Louis it is an invariable concomitant of the intestinal disease, which he considers the anatomical character of true typhus. But, in this country at least, it is also very often observed where there is no such local disorder.*

It appears, then, that the occurrence of petechial eruptions in continued fever has led to a considerable variety of speculations as to their nature and the nature of the disease in which they are presented. Some have been contented with arranging the cases under the general head of continued fever, but with the special title of petechial fever; others hold this petechial fever to be a specific fever, originating in a specific infection, and capable of producing, or of being produced by itself alone: others maintain that, as the eruption appeared to them to break out very regularly on a special day, the disease is specific, and one of the febrile exanthemata, among which accordingly they are inclined to arrange it; and, lastly, by many French pathologists one variety, the diffuse pale petechia, is thought peculiar to dothinenteritis.† In the opinion of the writer, founded on the observation of several epidemics of fever, varying much in type, none of these doctrines is tenable except the first, which assigns a specific name, for the sake of convenience, to a mere variety of common continued fever. And petechiæ can be correctly regarded in no other light than as an incidental circumstance in fever, neither confined, nor essential, to any one species of it.

In the preceding statement a considerable variety of eruptions have been comprehended under the general designation of pete-

* [These spots are not petechiæ at all. Dr. C. has here confounded a cutaneous efflorescence with a cutaneous or subcutaneous hemorrhage.]

† [Andral, Chomel, Piorry, Rostan, Cruveilhier, Bouillaud, &c., admit that the lenticular rose spots occur, though but rarely, in other diseases. Chomel, moreover, insists that it is the number of these papulæ which give them value in the diagnosis of typhoid fever. They are to be found in mild, as well as severe cases of typhoid fever. Dr. Louis says, that they are as *rare in other* acute diseases as they are *common* in this. (See section on *Typhoid Fever.*)]

chiæ. But some have distinguished, under the name of *measly eruption*, one of the varieties of it, where the spots are clustered in groups, and distinctly somewhat elevated, so as to resemble closely the eruption of rubeola. This form appears to occur in the same circumstances with the diffuse pale petechiæ, namely, in cases of typhoid fever and in the typhoid stage of synochus; there seems no practical reason for viewing it as a distinct eruption; and, indeed, the one form may be observed passing into the other, both in the same case, and in different cases of fever.

Allied to petechiæ, in all probability, as to nature, are the *vibices*, which sometimes show themselves late in fevers of the typhoid type, and also, though more rarely, in the early period of those which commence with an inflammatory stage. These are large spots, varying in size from that of a pea to that of a half crown or upwards, of the colour of venous blood, diffusely circumscribed, roundish or irregular, sometimes with, but more commonly without elevation of the skin, and bearing a considerable resemblance to the marks of bruises. They are most generally seen on the parts on which the body rests, the shoulders, back, nates, calves, heels, elbows, ears, occiput; but not unfrequently they are also seen on every other part of the body except the face. They are, in the majority of cases, connected with great depression of the pulse and exhaustion of the nervous system; yet sometimes, like the analogous eruption of *hemorrhœa petechialis*, they are rather associated with a state of reaction, and appear, therefore, early in the disease, and in those types which are inflammatory at the commencement. They occur only in the most severe cases; and, in typhoid fever, they are for the most part of fatal import. If the patient escape the typhoid exhaustion which they accompany, they are apt to lead to gangrene in those parts which are subjected to pressure.

[Dr. Christison has confounded the exanthematous eruption, or rash, by many regarded as characteristic of typhus, with the vascular extravasations known as petechiæ. As a diagnostic symptom of the disorder, it has only been carefully studied within a few years. It was noticed by Rogers, in the fever which prevailed in Ireland, during the year 1731; by Huxham in 1734–5; by Sir John Pringle in 1750; and by others. Hildenbrand described it, in 1806, more particularly than any other previous writer. There is no doubt but that continued fever of a low type occurs both without *petechiæ* or the *exanthematous rash;* and that both may occur successively, or together, or each may be present alone. Borsieri speaks of *febris petechialis sine petechiis.* And in the epidemic of Prague of 1740, it was remarked that whilst French soldiers were exempt from petechiæ, the inhabitants were covered with them. Dr. Watson observes, that

"it occurs in some epidemics more than in others. Fever is very rife in St. Giles, and in other crowded parts of this town just now (1838). Our wards at the Middlesex are full of it; and scarcely a case presents itself without these spots. We speak of it familiarly as the *spotted* fever; or from the resemblance which the rash bears to that of measles, as the *rubeoloid* fever." He adds, "You cannot well confound this mottled rash with *petechiæ*, which are little specks, or dark circular spots, resulting from a minute extravasation of blood beneath the cuticle. The specific rash and these petechiæ are, however, sometimes mingled together." Dr. COPLAND holds this language:—"If I refer to my own observations in different parts of the continent, some time after the late war, and in various parts of this country, both before and subsequently, I shall find, 1st. That *petechiæ* and vibices were either seldom or rarely seen for several years in some epidemics, excepting in the most severe or malignant cases, or when favoured by a too stimulant treatment and a too heating regimen during the early stages; and that, at other times, they appeared more frequently in the advanced periods of the lowest forms of fever, and even, although much more rarely, towards the termination of synochoid fever, when antiphlogistic remedies had been neglected in the stage of excitement. 2d. That this change in some epidemics was a very common or even general symptom, occurring in mild as well as in severe cases, although presenting very different appearances in each; and that they were sometimes observed early in the low states of fever, particularly when caused by unwholesome and deficient food, by a foul atmosphere, or by infectious miasms. 3d. That they were very frequently connected, especially in the plethoric, in the previously unhealthy, and in persons using much animal food, with evident change of the circulating fluids, with predominant disorder of the digestive organs, with a soft, broad, and open pulse, and with hemorrhages from the intestines, and a tendency to disorganization of the mucous surface of the bowels. 4th. That an *exanthematous rash* or eruption was observed in some epidemics, from the third to the eighth day of the fever, was quite distinct from petechiæ, generally appeared earlier, and was, in some cases, either associated with, or succeeded by, petechiæ or vibices, or even both. 5th. That this exanthema was of a reddish colour, varying in deepness, and rarely passing to a dark hue; that it occurred in cases characterized by vascular reaction in the early stage, as well as in those of a very low grade; in the mild, in the complicated, and in the severe; that this eruption was most probably overlooked in many cases where it existed; and that it was very generally confounded with petechiæ, owing to its late appearance, or to its colour changing, in a somewhat similar manner to petechiæ, with the states of vital power and of the circulating fluids.

6th. That, although the difference between these affections of the skin has been insisted on by HILDENBRAND and NAUMANN, it has been too widely drawn by them, and without due reference to the occasional association of both affections." HILDENBRAND says, that they do not always exist, and that frequently they are not remarked, if not looked for attentively. Dr. STEWART remarks, "that the eruption of typhus was unnoticed at Edinburgh, until the attention of physicians was called to it by Dr. PEEBLES in 1832,"* and adds, "that it is also well known to many, that previous to a visit which Dr. PEEBLES made to the Glasgow Fever Hospital, in the spring of 1835, the exanthema of typhus, then found to be of general occurrence, had neither been looked for, nor registered in that institution, and was received as a new discovery."

The eruption was general and characteristic in the epidemic fever which prevailed in Ireland during the years 1817, '18 and '19. Dr. BRACKEN states, that of about 250 cases which fell under his care, the majority had eruptions of spots of various appearance as to size, shape and colour. Drs. BARKER and CHEYNE state, that eruptions of different kinds very generally accompanied it. Dr. M. BARRY, of Cork, evidently implies from his remarks, that its occurrence was frequent. Dr. FITZGERALD, of Clonmell, observes, that it occurred in four cases out of five; and Dr. O'CONNEL says, that at Listowel, he did not see five cases of the fever unattended with the eruption. In Connaught, the same authors affirm, that it was a general symptom of the disease. Dr. ROUPELL states, that in St. Bartholomew's Hospital, London, the eruption of typhus occurs in seventy out of every hundred cases. Dr. WEST's testimony is to the same effect, or even stronger; for he thinks it probable, that in the cases in which no rash was observed, it had disappeared before their admission. Dr. COWAN has investigated the frequency of the eruption in the Glasgow Fever Hospital, in upwards of two thousand cases, during the years 1835–36; and his results are the following:—At the close of the year, in 76·16 per cent. of the males, and 71·77 of the females; giving as an average of the whole cases 73·79 out of every hundred admitted. Dr. HENDERSON remarked the eruption in 108 out of 130 cases admitted in the Edinburgh Royal Infirmary. In the Glasgow Fever Hospital, from May 1st to November 1st, 1839, during which time the presence or absence of eruption was carefully noticed, the proportion was as follows:

* [This is not altogether correct; for Dr. ALISON, in 1827,[a] described it as a very frequent symptom of the epidemic which prevailed in Edinburgh about that period, occurring in a majority of the cases.

[a] Ed. Med. & Surg. Journ., vol. xxviii.]

	Males.	Females.	Total.
Cases with eruption,	224	217	441
Cases without eruption, or doubtful,	130	120	250
			691

Dr. Peebles (1835) found the eruption as constant as any exanthema of other eruptive diseases. In the Philadelphia epidemic of 1836, Dr. Gerhard says of the rash, that "it was present in thirty-two out of thirty-six whites. Of the four cases in which it was not visible, one died upon the seventh day of the disease, and the others presented slight symptoms of fever, which disappeared in the course of four or five days. It was also visible, though less distinctly, in mulattoes; and we may infer that colour of the skin alone prevented its development in the negroes." In the winter epidemic of this country in 1812–13, spots on the skin occurred in most of the cases at the commencement of the disease in 1807; the next year they were less frequent; and in subsequent years they were not met with at all before death.

Another fact which strongly supports the opinion that typhus, in a great majority of cases, is attended with an eruption, is the fact mentioned by Dr. Davidson, (*Thackery Prize Essay*, p. 22,) that "almost all the instances of fever which have occurred during the last six or seven years among the physicians, clerks, nurses, &c., of the Glasgow Fever Hospital, have been accompanied with this exanthema. We have made most careful inquiries respecting this point, and have only heard of one or two exceptions, amongst at least one hundred cases."

According to Dr. Copland, the eruption usually appears from the third to the seventh day of the fever; but may be delayed to the twelfth or fourteenth day. Dalmas (*Dict. de Médecine*, t. xxix., p. 859), says, that it is about the third or fourth day that the eruption manifests itself; but that it may be delayed much later. Borsieri mentions that in one of his patients it did not make its appearance until the fourteenth day. Hildenbrand fixes the fourth day for its manifestation. Dr. Stewart ascertained the exact time of the appearance of the eruption in fifty-two cases; this time varied from the second to the thirteenth day; but in twenty-nine cases, more than half of the entire number, it appeared on the fifth or sixth day; and in three-fourths it appeared from the fourth to the seventh day. Dr. Henderson's observations correspond with those of Dr. Stewart; he noticed, that as a general rule, the progress and development of the eruption corresponded with the increasing severity of the other symptoms of the disease. Dr. West states that in his cases it first showed itself from the sixth to the eighth day. In the Irish epidemic of 1817, '18 and '19, the rash appeared about the fourth or fifth day; rarely earlier. In Dr. Gerhard's cases the eruption appeared

from the sixth to the eighth day after the commencement of the disease. In forty-eight cases observed by Dr. Stewart, the eruption began to decline, at different periods, from the eighth to the nineteenth day. It was still more irregular in the time of its disappearance, since this ranged from the thirteenth to the thirty-first day. The average duration of the eruption was eleven and a half days. Dr. Henderson found that the decline of the eruption was nearly simultaneous with the first signs of convalescence. In the Philadelphia epidemic it gradually faded away and disappeared from the fourteenth to the twentieth. Dr. Watson says, that it sometimes disappears entirely after two or three days; sometimes it lasts a fortnight or more. According to Copland, the duration is from three to five days. When the exanthema is slight, it disappears without leaving discernible marks; but when it is exuberant, stains are left in the situation of the papulæ.

Huxham describes the eruption as an efflorescence like the measles, but of a more dull and lurid hue, in which the skin, especially on the breast, appears, as it were, marbled, or variegated. Pringle's description corresponds; he says:—"There are certain spots, which are the frequent, but not inseparable, attendants of the fever in its worst state. They are of the petechial kind, of an obscure red colour, paler than the measles, not raised above the skin, of no regular shape, but confluent." Dr. Bracken describes them as of a diffused appearance, gradually shading off, and insensibly disappearing, and of the size of a grain of hempseed, though sometimes much larger, or smaller. Drs. Barker and Cheyne speak of it as a rash much resembling measles. Dr. Stewart, who studied the characters of the rash with great care, says that it is permanent; "that is, that it does not consist of successive eruptions of spots; that, in all cases, it presents the two periods, longer or shorter, of increase and decline; and that, in the more severe cases, it may exhibit, during the period of increase, four different states, being florid, dark, livid and petechial. When the hue of the eruption is florid, it disappears readily under pressure; when dark, it still disappears, but more slowly; when livid, semi-petechial, or pseudo-petechial, as it has been called, it is only partially effaced; and when petechial, it is not in the least affected by pressure. In many cases it remains florid throughout; in others it presents one or more, and in not a few all these alterations; and after it has reached its height, the process is inverted, and it passes through the various phases of lividity, darkness, redness, and paleness, before its evanescence. Of one hundred and thirty-nine cases of typhus observed by Dr. Stewart, the eruption was pale in about one-fourth; florid in between one-sixth and one-seventh; darkish in between one-eighth and one-ninth; livid in rather less than one-ninth; and petechial in about one-eighth."

Dr. Copland says, that where petechiæ and the rash exist together, "they are quite distinct and different in their appearances; for the latter is never so dark or livid as the former generally is, and the petechiæ are not attended by the elevation of the cuticle and roughness characterizing the eruption. The stains left by an exuberant eruption generally become livid when petechiæ are present; but the eruption itself does not assume a dark tint as long as it retains its papular form. In the more malignant cases, and when petechiæ appear early in the disease, the colour of the eruption may, however, become deeper, or may change with the alteration in the fluids and softer solids." This eruption exists upon the breast, neck, shoulders, arms, back and thighs; rarely on the face or hands. It has been seen upon the lips. Pringle mentions an instance where the only spot it appeared on was the arm immediately below a ligature applied in the operation of venesection. Borsieri avers that they are more frequent in those places where cups have been applied.]

Gangrene and *sloughing*, however, are more commonly preceded, not by vibices, but by *erythema* merely. An erythematic inflammation, affecting first the mere surface of the true skin, and gradually extending deeper, is a frequent occurrence in severe continued fevers, which present a marked typhoid character in the latter stage. It may occur wherever the body is subjected to pressure from its position; but is much more frequent on the nates, the lower end of the sacrum, and the back of the shoulders, than anywhere else. If not arrested by remedies, or by the early resolution of the fever, it is extremely apt to put on an ash-gray colour on the surface, which is an almost infallible mark of approaching gangrene of the part. Sloughing, of course, ensues; and the patient may die exhausted of this disorder after he has recovered from the proper symptoms of fever. A fatal event, however, is by no means so frequent in these circumstances as might be looked for. If the nervous system rallies from the state of typhoid depression, the sloughs for the most part separate, the cavities heal up by healthy granulation, and complete recovery takes place. In some epidemics vibices and erythema with consequent sloughing, are unusually prevalent, and then occasion many deaths, especially in persons beyond the middle term of life.

[Gangrenous sloughs and ulcerations seem to be common in some epidemics of typhus fever and rare in others. At Philadelphia, in 1836, they were present in only three or four cases in a hundred. Dr. Pickels says, that gangrene of the hips, nates, and shoulders was frequent during the epidemic at Cork, in 1817, 1818 and 1819. Dr. O'Brien, in his Cork Street Hospital Report for 1820, informs us, that ulcerations and gangrene of the hips,

nates, and sacrum were of very common occurrence; few of the malignant and protracted types of fever being exempt from them. Dr. PERCIVAL of Dublin says, "gangrenous extremities were extremely rare amongst my patients."]

Erysipelas is at times a rather common, and always a very troublesome, secondary disorder. It occurs chiefly when idiopathic erysipelas prevails, and, above all, when it is epidemic in hospitals, as secondary to wounds and operations. In fever the usual period for erysipelas manifesting itself is rather after the crisis has begun to form, than during the full height of the fever. It appears, like idiopathic erysipelas, most commonly on the face and head; and it runs precisely the same course, sometimes terminating early in symptoms resembling meningitis, sometimes leading to spreading inflammation of the cellular tissue underneath the skin, and serous effusion or sloughing; sometimes resolving itself simply, or by vesication. It is always an unfavourable occurrence; and a large proportion of cases, where it is unequivocally formed, prove fatal.

The only other eruption of the skin which requires notice is *Miliaria.* Frequently in the inflammatory type of continued fever, and much more rarely in its typhoid forms, an eruption appears over the body generally, but in particular over the breast, shoulders, neck, and abdomen, consisting of small white, rarely reddish spots, of the size of a pin's head, distinctly elevated, and filled with a clear fluid. They appear, for the most part, rather early in the disease. Sometimes they seem connected with sweating, break out immediately after a diaphoretic crisis, and then constitute what authors term *sudamina.* Frequently, however, they show themselves during the height of high inflammatory fever, and before the appearance of sweating. They are a favourable sign rather than the reverse; at least they occur most frequently in those forms of fever whose average mortality is the lowest—namely, where reaction is the predominating character.

III. SEQUELÆ.

To the foregoing observations on the secondary disorders which accompany continued fever, may be appropriately annexed a sketch of its *sequelæ.*

Here, in the first instance, it may be observed that serious sequelæ are, on the whole, rare; that the body generally rallies promptly and steadily from an attack of ordinary fever, when convalescence is fairly established; and that the restoration to health is seldom interrupted by incidental diseases. Such is found to be remarkably the case with young persons between puberty

and early manhood. In them it is very commonly observed, where no infirmity of constitution preceded the fever, that the body becomes even more robust than before; some infirmities of constitution, such as dyspepsia or derangements of the bowels, seem to be carried off; and not unfrequently young adults, who have ceased, or nearly ceased, to grow, gain a considerable accession of stature during the short period of their illness. Serious sequelæ present themselves chiefly in the following circumstances:—where marked infirmity of constitution preceded the attack of fever; where the patient has been imprudently subjected to some rash exposure during early convalescence, or commits some other important error in regimen; and, finally, where the individual is considerably past the middle term of life. Even under these co-operating circumstances sequelæ are rare; and fever really seems to deserve the reputation it has long enjoyed, of having a tendency to carry off the seeds of lurking diseases. Many instances of apparent sequelæ are nothing else than the full development of inveterate maladies, formed before, and merely latent.

Among the sequelæ may first be mentioned *Relapse*. The other consequences which have been witnessed, or alleged to occur, are principally rheumatism and neuralgia—partial palsy—œdema and phlegmasia dolens—various febrile inflammations, especially peritonitis and pleurisy — phthisis pulmonalis and mania.

Relapses are apt to occur more or less after all continued fevers; but they are rare in those of the typhoid type: they are more frequent in synochus; and most frequent in mere inflammatory fever. In the inflammatory epidemic of 1817–20 in Edinburgh, they occurred, according to Dr. Welsh, in no less than almost a fifth part of the cases. When they occur in typhus, and even in synochus, they may commonly be traced to some error in diet or regimen, most generally to the former. It is well known that, even in health, the digestion of a meal is followed by a certain degree of exaltation of the pulse and animal temperature, constituting a kind of febricula. During convalescence from continued fever, especially in the young, this excitement is often very considerable, the pulse rising from 60 or 70 to 90, the heat of the skin also increasing, the pulse at the temples throbbing somewhat, and the general disturbance coming to a close in two hours or more by the supervention of diaphoresis. Where the patient violates the rules of correct regimen by imprudent excesses in eating during early convalescence, this febricula is apt to pass into confirmed pyrexia, and his fever is renewed. Relapses, from whatever cause they spring, are commonly ushered in with an attack of rigor or great chilliness: and vomiting is not unfrequent also. The symptoms may afterwards present all the severity of

the original attack, or even more; and occasionally they prove fatal. But, for the most part, they are slighter; and their average mortality is unquestionably much less. A remarkable fact, formerly quoted in support of the doctrine of the essential character of continued fever, is, that in relapse secondary affections are decidedly more uncommon than in the primary attack.

[True relapses rarely occur in typhus. Any difference of opinion on this subject among authors, would seem to arise from different meanings being attached to the term. Relapses, according to many writers, do not mean a return of fever after complete convalescence, but a return of the symptoms with their former intensity, after a partial recovery, or, more properly speaking, a remission. When relapses take place, there is generally local organic disease. In all the cases of typhus admitted into the Glasgow Fever Hospital, from May 1st to Nov. 1st, 1839, there was not a single relapse into the same febrile state, characterized by a new eruption, and the other distinctive marks of the disease. (Davidson.) In the Irish epidemic of 1817, relapses were very rare. Dr. Veitch, Physician to the County Infirmary, Galway, says that he did not observe one case of relapse out of several hundred cases of fever. Dr. Henderson affirms that typhus never relapses. Out of 1600 or 2000 cases, he himself never met with one instance of relapse; the only affections which might have been termed relapses, being febrile attacks dependent upon the existence of some local inflammation occurring during convalescence. Speaking of the celebrated epidemic of typhus, which occurred in Glasgow, Dr. A. P. Stewart observes, that he has never, among thousands of cases, seen a single case of relapse, in the proper sense of the term, after the symptoms had begun to decline. Dr. Perry's testimony is to the same effect. He states of 1145 cases of typhus treated by him in the Glasgow Hospitals, in 1831, nineteen of the so-called relapses occurred; but all these were either cases of fever supervening upon some local inflammatory affection, and caught in the hospital, or local affections occurring during convalescence from the fever. He adds, "that it is as absurd to talk of a relapse of typhus, as to talk of a relapse of small-pox or measles." Dr. Edward Percival states, that relapses were extremely rare at the Hardwicke Fever Hospital; and Dr. Alfred Hudson says, that of five hundred cases of fever admitted into the Navarre Hospital in 1840, only two instances of true relapse occurred.]

In one form of fever, namely Synocha, the circumstances of relapse are sometimes exceedingly singular and interesting. In the synocha, formerly described as having been common in Britain during the earlier part of the last twenty-five years, and where the fever in a considerable proportion of cases was abruptly resolved by a fit of copious sweating, relapses were so ex-

ceedingly frequent, as to have been thought by some, not without an appearance of reason, to constitute a part of the primary attack, rather than to merit the name of relapse in the strict meaning of the term. In the cases alluded to, the patient's convalescence went on steadily and swiftly for a few days, till at length the pulse became perfectly natural, the tongue clean and moist, the appetite good, the digestion natural, the strength much improved—in short, complete health seemed on the point of being restored; when, at last, very regularly about the close of the thirteenth or during the fourteenth day from the commencement of the primary attack, violent rigors set in, commonly accompanied with vomiting; and, in an hour or two, the whole symptoms of synocha, as described above, succeeded in regular order and in great force. This state lasted for three days, when the fever again ceased abruptly with profuse perspiration; and afterwards convalescence went on steadily, and without farther interruption. It seemed that no precautions as to diet and regimen were of any service in averting this relapse; it was as frequent among those who were confined to bed and kept on low diet, as where considerable latitude was allowed upon an opposite system; and the latter cases generally had rather a milder attack. Relapse was far more rarely attended with local inflammation than the primary attack. It was very seldom fatal. In one or two instances only it was protracted into a synochus, and proved fatal in this shape.

[This is another point of the resemblance between this epidemic and that in Scotland in 1843, already pointed out. (p. 86.) In the five-day form, which occurred with the typhus in Ireland in 1817, Drs. Barker and Cheyne speak of the tendency to relapse.]

Partial Rheumatism and *Neuralgia* are common sequelæ of continued fevers of all kinds. They usually show themselves during convalescence in its early stage, and most frequently after fevers tending more or less to the inflammatory type; but, above all, subsequently to synocha, where it terminates by diaphoretic crisis. The parts most commonly affected are the shoulders. It is an affection which may be the source of much suffering for the time; but it seldom lasts out one week, always disappearing with the return of strength. Acute rheumatism is rare, and arises, like its attacks in ordinary circumstances, under some decided exposure, and probably in the predisposed alone. Persons convalescing from fever generally retain for some time a power of resisting exposures without injury, to a degree which would not be anticipated. There are exceptions; yet, certainly, the general rule is, that, after attacks of fever of moderate duration, the body, however much reduced, withstands cold with unusual facility.

A remarkable sequela, not frequent, yet sufficiently so to have attracted the attention of those conversant with fever in the epidemic form, is *Partial Palsy*. The parts most generally observed to be affected are the deltoid muscles, and the joints of the knees and ankles; but the muscles of the face, at times, also suffer. The paralysis of the particular muscle, or of the particular movements of a joint, is sometimes complete, more frequently incomplete, seldom attended with any diminution of sensation, occasionally accompanied by pain, more generally not, and altogether independent, either of signs of an affection of the head, or of any appreciable disturbance of the circulation or digestion. When it affects the limbs, it has been mistaken by the inexperienced for an affection of the spine, and treated accordingly by persons who find in that organ a cause for every disorder which is to them otherwise unintelligible. But, for the most part, it ceases gradually after convalescence is firmly restored, and it is best managed by invigorating treatment and regulated exercise. Sometimes, however, it is very inveterate.

Œdema has been mentioned by most writers on continued fever as a frequent sequela in severe cases. As confined to the ankles only it is not altogether uncommon in early convalescence, when the patient first takes walking exercise; but it is then a trivial complaint, dependent on mere debility, which never becomes considerable, and disappears as the strength returns. Anasarca of more considerable extent is, on the contrary, rare; and though usually ascribed, in common with its slighter form, to debility, may be justly suspected to occur in connection with some old organic disease, and more especially with granular degeneration of the kidneys, or with diseased heart.

During the early stage of convalescence, an affection occasionally presents itself, which resembles the *Phlegmasia dolens* of puerperal women, and is sometimes apt to be mistaken for œdema. It is generally preceded by some general fever. Its symptoms are pain, swelling, tension, heat, and glistening whiteness of one limb, extending from the groin downwards, with inability to move the limb. It generally ends in resolution and recovery; but amendment takes place slowly, and sometimes it terminates in serous effusion and diffuse suppuration of the intermuscular cellular tissue. It is in all probability a variety of subcutaneous cellular inflammation. Of this affection, which was first described by Dr. Tweedie in 1828 as an occasional sequela of fever in the London Fever Hospital, several characteristic examples occurred in the epidemic of Edinburgh in 1817–20.

Acute *febrile inflammations* are apt to occur during convalescence from rash exposures; but they are not so common as might be expected. They are most frequently observed in the wards

of hospitals, where all patients are often alike exposed to cool or cold air, whatsoever the stage of their fever, and, in particular, are at times subjected to local draughts of cold air from open windows. In cold weather an attack of coryza, with or without symptomatic fever, is frequent among those who go out of doors prematurely. The species of local inflammation which are most common, are pleurisy and peritonitis; pneumonia and cynanche laryngea are less frequent. Peritonitis is the most common of them. These disorders generally put on a very acute character, commencing abruptly, and quickly running a fatal course, if not energetically treated. They seem to be more common after inflammatory fevers, and after synochus with a well-marked inflammatory stage, than after typhus.

A good deal has been said of the tendency of continued fever to bring on *phthisis pulmonalis* in the predisposed. The supervention of phthisis is held by some to be in the ordinary course of events. But if long and intimate observation of the progress of several extensive epidemics in Edinburgh may be adequate to decide the point, then it seems clear that consumption is a very rare result, and its origin in fever as a predisposing cause, very problematical in any instance. Consumption is most frequent at the very ages when fever is most frequent. If one disease then led to the other, the concatenation ought to be witnessed so frequently as to be placed beyond all possible doubt as a fact. Nevertheless, it seldom happens that a fever patient exhibits symptoms of incipient phthisis on throwing off the febrile state; and hence, where such an incident is observed, the presumption must be, that the seeds of the apparently supervening disease were sown before the attack of fever commenced. In most instances, indeed, this may be positively ascertained to be the case, on carefully inquiring into the history. Continued fever has clearly no particular tendency to lead to the formation of chronic organic diseases. On the contrary, as it has a marked tendency to remove functional disorders of the viscera—which, as already remarked, often disappear after an attack of fever—we may rather presume that organic diseases which originate in functional disturbances, must in that way be sometimes averted.

Mania has been mentioned by some as an occasional sequela; but in common with other affections of the brain, whether acute or chronic, functional or organic, it is of extremely rare occurrence. No better proof than this perhaps can be given, of the little connection subsisting between continued fever and inflammation of the brain, or any other organic disease there. In the fevers of Britain no other organ is so frequently and so far disturbed in its function while the disease lasts; yet scarcely any other shows so little tendency to retain the traces of disease after the fever has thoroughly

subsided. In some instances a certain feebleness of intellect remains for a few weeks, as shown by listlessness of the faculties, indisposition to mental exertion, sluggishness in conversation, and defective memory. But this state very seldom outlasts the restoration of the muscular strength. More generally the mind is, from the commencement of convalescence, in a state of integrity, and eventually is found to become more acute. Sometimes, too, there is from an early period of convalescence an extraordinary activity of the mind, clearness of thought, facility of expression, and brightness of memory, which even recalls incidents long forgotten.

IV. PREVALENCE, DURATION AND MORTALITY.

It may not be out of place to wind up the preceding account of the symptoms of continued fever, essential as well as secondary, by some notice of its prevalence, duration, and mortality.

1. PREVALENCE.—It is not easy to obtain a distinct conception of the prevalence of fever, in consequence of the want of sufficiently extensive and accurate statistical tables, showing the amount of cases relatively to other diseases, and to the general population, for a moderate term of years. There is no question, however, that if the average of a number of years be taken, and the general population of towns as well as of the country be included, fever will be found to constitute the most frequent of all diseases, and to occasion a larger proportion than any other of the general mortality.

The extent to which continued fever prevails, both absolutely, and relatively to other diseases, varies greatly in different years in the same place; it likewise varies much at the same time in places situated alike in most respects; and farther, places circumstanced to all appearance very much in the same manner, present marked differences in their liability to the disease at all times.

The progress of epidemic fever through a series of years is very well shown by the following table of its history in Edinburgh since 1817, founded on the documents in possession of the Fever Board. The numbers show only those cases which were sent into hospitals:

	Years.	Cases.		Years.	Cases.		Years.	Cases.
Nov.	1817			1826 -	697		1833 -	878
to Nov.	1819 -	2470		1827 -	1837		1834 -	690
	1820 -	620		1828 -	1862		1835 -	826
	1821 -	413	Nov.	1829 -	619		1836 -	841
	1822 -	356	to Mar.	1830 -	163		1837 -	972
	1823 -	248		1831 -	191		1838 -	1994
	1824 -	218		1832 -	1225	to Mar.	1839 -	1981
	1825 -	328				to Oct.	1839 -	338

The best view yet given of the prevalence of fever in a great town is to be found in the excellent statistical account of fever recently published by Dr. Cowan of Glasgow. By uniting two of his tables, the following valuable facts are obtained for a period of forty-three years prior to 1838, showing the prevalence of fever in that class of the population which resorts to hospitals, so far as may be deduced from hospital admissions merely:

Year.	Population.	Admissions.		Year.	Population.	Admissions.	
		General.	Fever.			General.	Fever.
1795	66,578	226	18	1817	- -	1886	714
1796	- -	338	43	1818	- -	3254	2336
1797	- -	545	83	1819	147,197	2825	1594
1798	- -	569	45	1820	- -	1570	289
1799	- -	631	128	1821	147,043	1454	234
1800	- -	733	104	1822	- -	1596	229
1801	83,769	702	63	1823	- -	1759	269
1802	- -	729	104	1824	- -	2091	523
1803	- -	806	85	1825	- -	2438	897
1804	- -	678	97	1826	- -	2317	926
1805	- -	719	99	1827	- -	2725	1084
1806	- -	700	75	1828	- -	3133	1511
1807	- -	726	25	1829	- -	2321	865
1808	- -	840	27	1830	- -	2010	729
1809	- -	886	76	1831	202,426	3183	1657
1810	- -	935	82	1832	- -	4119	2733
1811	110,460	826	45	1833	- -	3082	1288
1812	- -	877	16	1834	- -	3879	2003
1813	- -	1022	35	1835	- -	3260	1359
1814	- -	1135	90	1836	- -	5130	3125
1815	- -	1340	230	1837	- -	7200	5387
1816	- -	1511	399				

For nine years of this period, prior to 1837, the same author has supplied the number of fevers treated at home by district medical officers paid for the purpose; and when the above numbers are corrected by the data thus furnished, the prevalence of fever will be found to stand as follows, for a population of about 200,000 inhabitants:—

Years.	Cases.	Years.	Cases.	Years.	Cases.
1828 -	2511	1832 -	3825	1835 -	1686
1829 -	2205	1833 -	1675	1836 -	3841
1830 -	1089	1834 -	2402	1837 -	7707
1831 -	1249				

It is probable that of all the great towns in Britain, Glasgow has been for some time the most unfavourably situated as regards fever; and the statements of Dr. Cowan undoubtedly show a fearful increase in the extent of its devastations. But other great cities are not much behind it in this respect. In Edinburgh, for example, during four severe epidemic visitations since 1816, each lasting between three and four years, the number of beds constantly

occupied in the hospitals has varied from 120 to 150; and for some time past (Jan. 1839), the latter number has been often insufficient to meet the demands for admission. A very remarkable fact is, the slight extent to which fever prevails in some of the large towns in England, and the improvement which has gradually been attained in that respect with them, while in Glasgow and Edinburgh the case stands directly the reverse. Dr. Cowan shows that, while in Glasgow, with a population of 200,000, the annual average of fever, deduced from seven years ending with 1836, has been 1842 cases, in Manchester, with a population of 228,000, it has been for the same period only 497; in Leeds, with a population of 123,400, only 274; and in Newcastle, with a population of 58,000, so little as 39. And he likewise states, that while in Glasgow the average fevers treated annually in hospitals, between 1797 and 1806, was 88, and has latterly increased to 1842; in Manchester the average has stood nearly the same, notwithstanding the great increase in its population, having been 462 in the early period, and 497 recently.

The statistical results of hospital experience, even when corrected by that of institutions for visiting the poor at their own houses, give probably a very imperfect idea of the real prevalence of fever in a community. In periods where there is no epidemic alarm, it seems likely that but a small proportion of the cases come under the notice of the statistical inquirer. And even in seasons of epidemic virulence, when the poor more readily seek assistance from public institutions, it would appear from the researches of Dr. Cowan, that little more than one-third of the fevers in a great city are accounted for in this way. In 1835–7 the cases of fever treated in hospitals, or by district medical officers, in Glasgow, were 1686, 3841, and 1707—in all 13,234 in three years: but reckoning from the annual bills of mortality, in which the deaths from fever are specified, and from the average mortality of fever in hospitals during these three years, there must have been altogether in that city 6180, 10,092, and 21,800 cases—or, in all, 38,074—very nearly three times the number accounted for.

[Dr. Alison says, "For many years past contagious fever has never been absent from Edinburgh, and there have been three great epidemics of that disease in the last twenty-two years, beginning in 1817, 1826, and 1836, each lasting nearly three years, and each of the last two affecting, I believe, nearly ten thousand persons. The number of fever patients admitted into the Infirmary and Auxiliary Fever Hospitals from November, 1817, to November, 1820, was 3090; from November, 1826, to November, 1829, it was 4318; and from October, 1836, to October, 1839, it was 4850." (*Management of the Poor in Scotland*, 2d ed., p. 8: Ed., 1840.) Probably not more than half the

cases which occurred during these epidemics were removed to the hospitals. Therefore the whole number of persons affected between 1836 and the close of 1839, must have been at least 10,000, a calculation most likely below the actual number. From the Statistics on Fever published by Dr. A. S. Thompson, it appears that fever is most prevalent from July to December.

The following table this author has compiled from materials selected indiscriminately from all the reports which he could obtain, showing the number of fever cases admitted into the various hospitals in Great Britain and Ireland; but he is chiefly indebted to Drs. Barker and Cheyne's account of the epidemic fever which prevailed in Ireland in 1817–18–19.

Table showing that of 51,944 *cases of fever admitted into different hospitals in Great Britain and Ireland, the number and relative ratio of admissions in each month were as follows:*

Months.	Number of Cases admitted.	Relative ratio of admissions per cent.
January	2895	5·6
February	2825	5·4
March	3152	6·1
April	3374	6·5
May	3990	7·6
June	4365	8·3
July	4999	9·6
August	5261	10·1
September	5046	9·7
October	5624	10·8
November	5054	9·7
December	5359	10·6
	Total 51,944	100·0

It appears from this table that the greatest number of fever cases were admitted into the different hospitals during the last six months of the year, or from July to December. And the number of cases admitted from January to June are few, compared with the admissions from July to December.*

Dr. Duncan remarks, (*First Report of Commissioners for Inquiring into the State of Large Towns, &c.,* London, 1845, *Appendix,*) that previously to the publication of the Reports of the Registrar-General, he stated his belief, founded chiefly on the records of dispensary practice, that 1 in 25 of the working population of Liverpool was annually affected with fever, and that this probably afforded a higher ratio than any other town in England. The maculated, or spotted fever, the true *Typhus Hi-*

* [Edinburgh Medical and Surgical Journal.—July, 1838, p. 100.]

bernicus, has probably always been endemic in Ireland. According to Mr. WILDE, that fever has raged nearly decennially in Ireland for the last 150 years. He says, as a general rule, it appears that fever there has become epidemic from the eighth to the twelfth year, with an interval of from six to eight years. And facts, during the eighteenth century, go to prove this assertion, with the exception of two lapsed periods. Thus, there was an epidemic in 1708, one in 1718–21, 1728–31, 1740–43, 1763–64, 1771–73, and 1817–21. The lapsed periods—the first from 1743 to 1763, the other, of thirty-four years, from 1773 to 1817—he seems to think may arise from deficiency of records for the period. One of the most appalling epidemics that ever invaded Ireland took place in 1817–18–19. Drs. BARKER and CHEYNE, its historians, state in their report, that "assuming the population of Ireland to amount to six millions, it will be no exaggeration to state, that a million and a half of persons suffered from an attack in the time included, *between the commencement of the years* 1818 *and* 1819. In the course of the two years commencing with September, 1817, more than 42,000 persons were admitted into the hospitals." During this epidemic the total number of persons admitted into the hospitals (both temporary and permanent) was 100,737.

From 1812 to 1820 typhus fever prevailed to more or less extent throughout the Northern and Middle States of this country. Since then partial epidemics have occurred from time to time. In Philadelphia, in 1836, an epidemic typhus appeared, but was confined chiefly to a portion of the town inhabited by the lowest and filthiest blacks. Sporadic cases have appeared since occasionally. The form of continued fever most common in this country—at least the northern and middle sections—is the *Typhoid Fever*, or *Synochus*, of CULLEN.]

2. MORTALITY.—The mortality of fever has been made the subject of frequent investigation in all parts of Britain, and many important numerical statements have been published, which contribute to give a precise view of the influence of this scourge on the lives of the community.

An exceeding difference prevails in the relative mortality of fever, under a variety of essential or collateral circumstances. In the first place, it is plain that some types of continued fever are much more fatal than others. Synocha is very rarely fatal; synochus much more frequently; typhus the most fatal of all. Hence some epidemics are much more deadly in the same place than others. There is also a great difference in the mortality, from the same kind of epidemic, in different places; and such differences are often little susceptible of explanation. In epidemics presenting the inflammatory character the mortality has

been observed, for a length of time, and upon a great scale, to be so low as one in 22, one in 25, or even one in 30. This was the fluctuation of the hospital mortality in Edinburgh, during the latter part of the epidemic of 1817–20; and an equally low average was observed in several parts of Ireland about the same period. In the recent epidemics of Edinburgh, which have assumed much more the typhoid or adynamic character, the average has been greatly increased. In the year 1826–7, in a total number of 1570 hospital patients, the mortality was one in 10·33. In the epidemic which has raged for some years past, the deaths have been still more numerous, in correspondence with a more purely typhoid type. The number of patients treated in the Edinburgh Hospital in 1837 and 1838 has been 1994 and 2606; and the proportion of deaths one in ten during the former year, and one in 6·27 during the latter. According to Dr. Cowan the average mortality, deduced from the observation of an unusual number of cases, was, in 1835–7, one in 15, one in 12, and one in 10. These proportions are much exceeded in some of the great cities of England—a fact which seems the more remarkable, that fever is in them much less prevalent than in Glasgow or Edinburgh. According to Dr. Bardsley of Manchester, the annual hospital average in that city has varied, between 1818 and 1828 inclusive, from one in 11¾ to one in 6⅓; and the average of the mortalities for all these years is one in 8¼. In the London Fever Hospital for the same period, the averages, according to Dr. Tweedie, have fluctuated between one in 10 and one in 5; and the average of the whole annual mortalities of the period was so high as one in 6½. Much more fearful mortalities, however, have been recorded than any yet mentioned. In Guy's Hospital in 1816, Dr. Marcet found the deaths to amount to one in 4; and, for a short period in 1799, Dr. Willan ascertained that among the patients treated at home in connection with a dispensary in London, the average deaths were actually one-half of the seizures. The mortality is seriously affected by liability to the entero-mesenteric affection, which has been described above as a frequent accompaniment of some epidemics. If M. Louis's experience be a fair representation of the general experience of French physicians in fever, the mortality occasioned by this bowel affection is fearful; for he lost 46 out of 132 patients, or one in 2·9.

[The rate of mortality in continued fever must necessarily vary with circumstances—with the form of the fever, with the character of the epidemic, with the season, &c. Hence the great differences in the mortality as observed and stated by writers at different periods. The mortality in some epidemics of *camp typhus* has been frightful. Out of 400 refractory conscripts sent to the prisons of Gaëta, Ducastaing relates that 300, or two-thirds, perished. At Dantzic, according to Tort, typhus carried off two-

thirds of the garrison and a quarter of the population. Desgenettes states (*Dict. des Sci. Méd.*, t. xv. p. 457), that of 25,000 soldiers who escaped to Torgau in the disastrous campaign of 1813, 13,448 died of typhus in the space of four months, more than one-half of the whole garrison of the town. At Antwerp, in 1814, Fleury states that one-half of those attacked died. Fauverges informs us that of 60,000 troops at Mayence, more than 25,000 died of typhus. At the hospital of La Charité, at Paris, in 1814, in the wards of Dr. Fouquier, the mortality was only one in 3. At the hospitals of Posen, in 1830, Dr. Hertzog lost only one-eighth of his cases; Landouzy, at Rheims, in 1839, the same proportion; at the epidemic of Bourges, which had Dr. Boin for historian, the deaths were one in 9. In 1814, at La Salpêtrière, Pinel tells us he lost but twelve persons out of 120 who were attacked, or one in 10. Delbooq relates, that amongst the Spanish prisoners, placed under highly favourable hygienic conditions, the deaths were only one in $18\frac{1}{2}$.* Dr. Alison found the mortality at all ages, as one in $9\frac{1}{5}$. Hildenbrand estimated the deaths in exanthematic typhus at one in 10. From the *Fifth Annual Report of the Registrar-General of England* (1843), it appears that out of 100,000 males dying under 5 years, 61 die of ague (intermittent fever), 61 of remittent fever, and 1086 of typhus. Out of 100,000 dying at 5 and under 10, 107 die of remittent, and 7166 of typhus; at 10 and under 15, 10,405 die of typhus; at 15 and under 20 (of males), 216 die of ague, and 10,173 of typhus; at 20 and under 25, 6568 die of typhus; at 30 and under 40, 3853 die of typhus; at 40, and under 50, 3591 die of typhus; at 50 and under 60, 56 of ague; 56 of remittent, and 2083 of typhus; at 60 and under 70, 1722 die of typhus; at 70 and under 80, 1440 die of typhus; at 80 and under 90, 186 die of remittent, and 186 of typhus. Out of 100,000 females under 5, 34 die of ague, 45 die of remittent fever, and 1144 of typhus; at 5 and under 10, 218 die of ague, 327 of remittent fever, and 8052 of typhus; at 10 and under 15, 274 die of ague, 274 of remittent fever, and 8493 of typhus; at 15 and under 20, 9534 die of typhus; at 20 and under 25, 5006 die of typhus; at 25 and under 30, 4333 die of typhus; at 30 and under 35, 60 die of ague, and 2776 of typhus; at 35 and under 40, 2615 die of typhus; at 40 and under 45, 2376 die of typhus; at 45 and under 50, 1544 die of typhus; at 50 and 55, 214 of typhus. The whole number of patients received into the several fever hospitals of Dublin, from August 31, 1817, to October 1, 1819, was 41,775; and the deaths during this period were 1972, being about one in 22. The highest rate, for any single quarter, was one in 15; the lowest, one in 32. The average mortality, during the same epidemic, in the South Fever Asylum at Cork,

* [Gaulthier de Claubry de l'Indentité, &c., p. 311.]

was one in 25.* The number of patients received into the Cork street Fever Hospital, of Dublin, between May 14, 1804, and January 5, 1806, was 20,278. In the year 1805, the highest mortality was one in 10; in 1815, the lowest, about one in 20; the average mortality for the entire period being one in 14.†

During the great Irish epidemic of 1817–18–19, the total number of persons admitted into the Irish hospitals was, as before stated, 100,737, of whom 4349 died. This is a small mortality relatively to the number attacked, being but one in 23. The mortality from fever in Ireland has been much exaggerated. In the most fearful epidemic of the last century, that of 1740–41, Dr. O'Connel states that the number that perished was 80,000; whilst Kulty says that it was computed, though probably with exaggeration, that one-fifth of the inhabitants died. In 1830, it was asserted before a select committee of the House of Commons, that 65,000 died of fever in 1817. What reliance, asks Mr. Wilde,‡ can be placed on such guesses, when it is discovered by statistics derived from sources much more accurate than former days possessed, that the mortality from fever in Ireland, in ten years, (from 1831 to 1841,) was a little more than 112,000.

According to Dr. Duncan, the mortality of fever in Liverpool is not more than one in 12 or 15. Dr. A. S. Thompson§ estimates the average mortality in Great Britain as one in 15 persons attacked by fever. He affirms, moreover, that the annual ratio of deaths from fever in London has decreased since the commencement of the 18th century.

The following table shows the number of deaths from fever in the five principal towns of England during the whole period (3½ years) comprised in the Registrar-General's published Reports.

Towns.	Deaths by Continued Fever.	Total deaths.	Per centage proportion of fever deaths to others.	Proportion of fever deaths to population annually.
Birmingham	502	12,224	4·10	1 in 917
Leeds (Parliamentary Borough)	661	14,747	4·48	1 in 849
London	9,150	189,379	4·83	1 in 690
Manchester (three years)	1,121	19,969	5·61	1 in 498
Liverpool and West Darby	2,060	33,022	6·23	1 in 488
Liverpool (Parish)	1,795	26,456	6·78	1 in 407

* [Trans. of Physicians of Ireland, vol. iii.]

† [Dr. O'Brien, Trans. of Physicians of Ireland, vol. i.]

‡ [Wilde on Causes of Death in Ireland, &c., in Census Report for 1845, Dublin, 1843, p. xxiii.]

§ [Ed. Med. & Surg. Journ., July, 1838.]

The decreased mortality in London from fever, for the last hundred years, as exhibited in the bills of mortality, is remarkable. In 1750 the deaths from fever, in London, were almost one-fifth of the whole mortality; whereas lately, and an epidemic period, too, they have not exceeded one-tenth. The total number of deaths from fever in 1838, as shown by the returns under the new registration act, was 4078, at which time the population may be reckoned at 1,888,800; the mortality from fever was consequently 2·32 in 1000. The mortality from fever has slowly declined since 1838. (*Brit. and For. Med. Rev.*, Jan., 1841.)

The following statement is from Mr. Farr's elaborate article on *Vital Statistics*, in Maculloch's work, vol. ii. p. 579,) and may be fully relied on from the well-known accuracy of that able statistician.

Mortality in London.—Deaths to 100,000 *living.*

	1629–35	1660–79	1728–57	1771–80	1801–10	1831–5
Fever	636	785	785	621	264	111
Spotted Fever	45	90				
Plague	125	1225				
Scarlatina						53
	806	2000	785	621	264	164]

To these facts may be appended a sketch of the influence of fever on the general mortality from diseases at large. On this important subject few precise facts have been made public, from which the average influence of fever may be determined for a series of years. But an extremely interesting view has been given by Dr. Cowan, of the relation of deaths in fever to the general mortality during the prevalence of the late virulent epidemic in Glasgow. In 1835–7 the deaths from fever alone were, according to the bills of mortality, which have been taken for some years past with unrivaled care, 412, 841, and 2180; and they constitute, in relation to the mortality from all diseases, one in 15·6, 10 and 4·7, annually; or, in the population at large, one in 570, 290 and 116. It has been supposed by some that epidemics of fever, although they may constitute a large proportion of the sickness of a place, and occasion a large proportion of the total deaths, nevertheless do not sensibly add to the mortality; and this statement is grounded on the fact, which seems well ascertained, that epidemics of fever, by seizing upon the feebler constitutions, occasion a palpable diminution of other diseases. The reason, however, may be true, and yet the inference false; because fever, especially in the typhoid form, is a more formi-

dable disease than the average of prevalent disorders: and that the inference is wholly false, appears abundantly from facts contained in the paper of Dr. Cowan. In 1824 the deaths were only one in 37 in the city of Glasgow, while during the late epidemic of 1835–7, they have increased to one in 32·6, 28·9, 24·6. In 1835–7 the total deaths from all diseases were 7198, 8441, and 10,270; and, on deducting from these numbers the whole deaths from fever, there remain for other diseases 6786, 7600, and 8090; so that, contrary to the common notion, the same causes which have increased so much the devastations from fever, have actually also increased the casualties from other diseases at large.

Duration.—It was stated under a previous section, that the duration of fever varies exceedingly, from a few days to several weeks; that inflammatory fever is often resolved abruptly between the fourth and ninth days, leaving nothing to be recovered from except debility and emaciation; and that typhus and synochus, on the contrary, commonly continue between eleven and one-and-twenty days without abatement, but sometimes for a much longer period, nay, even for twice the longest of these intervals. That interval too may be prolonged by local disorders supervening. In the mixed epidemic of 1817–20 it appears from the tables of Dr. Welsh, that the average duration of fever between seizure and the establishment of convalescence was twelve and one-third days; but in the late typhoid epidemic the time must be somewhat greater.

Convalescence in general proceeds more slowly in fever than in other diseases requiring similar treatment—probably because fever, by virtue of its two essential constituents, reaction of the circulation and nervous exhaustion, leads to more general disturbance and more extensive derangement of most of the animal functions. According to Dr. Weslh, the average stay of fever patients in hospital in the inflammatory epidemic of 1817–20, was very nearly twenty days; and the average duration of the disease at entrance was seven days; so that four weeks may be taken for the period when patients are able to take care of themselves. According to Dr. Cowan, the average stay in hospital in the more typhoid epidemic of Glasgow in 1836 was eighteen days. This will give nearly the same ultimate result with the calculations of Dr. Welsh; because, in consequence of the more insidious mode in which synochus and typhus have commenced in late epidemics, patients do not generally arrive in hospitals so early in the disease. Four weeks, however, by no means constitute the full amount of the duration of sickness, as estimated by the time the patient is absent from his usual occupations. Dr. Cowan considers six weeks a low average for expressing this fact; and, from observation in the instances of medical students,

where the whole circumstances may be accurately ascertained, it is probable that the real average is not less than two months.

V. ANATOMICAL CHARACTERS.

The pathological anatomy of continued fever remained, till lately, in a very crude and unsatisfactory condition. But no other topic has attracted so much attention during the last five-and-twenty years, or has been investigated with more success, so far as the accumulation of facts goes. Whether the result has been hitherto beneficial in reference either to pathological doctrine or medical practice, is a question which admits of some doubt. A very great variety of morbid appearances have been indicated as occurring in fever. Of these many are plainly incidental, because they do not, by any means, present themselves regularly. Others, however, have been held to be invariable; and consequently authors have sought for the nature and essence of fever in the local morbid action which gives rise to such appearances. On taking into account the general result of the observations of all pathologists of credit, it seems impossible to avoid the conclusions, that no morbid appearance is invariable except congestion of internal organs; that every other pathological fact which has been observed is not constant, and is, therefore, the effect of a secondary disease; and that, in all the observations hitherto made on the pathological anatomy of fever, we must be content with discovering its consequences, not its causes. The information which has been amassed is important in a practical point of view, as turning the attention of practitioners to the necessity of studying and treating those secondary affections which, in various circumstances, are the occasion of suffering, danger, or death. But it does not seem to throw much light on the real essence of fever; and, by being rashly assumed to furnish that light, it has led to grave theoretical and practical errors.

In the first place there can be no question that cases of death from true continued fever, of the typhoid or synochus type, occasionally present themselves where no morbid appearance whatever is detected, except congestion of internal organs. In such cases it is usual to find the sinuses of the dura mater somewhat turgid with blood; the blood-vessels of the membranes of the brain more or less gorged, sometimes considerably so, and the substance of the brain unusually checkered with bloody points when cut across; the bronchial membrane of the lungs dark and vascular; the intestines also vascular, and the vessels well-marked in consequence of being distended with dark blood; the gastro-intestinal mucous membrane spotted here and there with

small points of ecchymosis, and in the depending parts with large brownish-red plates of extravasation into its substance, or rather into the submucous cellular tissue; the mucous membrane of the bladder similarly affected; and generally, too, the external surface of the body unusually discoloured by lividity, especially in the depending parts. In addition to these indications of vascular congestion, there is very commonly found some effusion of serosity into the ventricles of the brain, and into the subarachnoid cellular tissue, as well as accumulation of serous fluid in the back part of the lungs, together with darkness and brittleness of the injected tissue. That some of these appearances exist during life seems highly probable. The occurrence of congestion of the cerebral membranes is rendered probable by the visibly congested condition of some external parts, such as the skin and conjunctivæ; and condensation of the posterior region of the lungs is often discoverable before death by the stethoscope. Nevertheless, it is material to remark, that all the phenomena now mentioned come also under the denomination of pseudo-morbid appearances, and may be occasioned merely by the particular manner of death, that is, slow failure of the respiration before arrestment of the circulation, or by organic processes carried on during the first few hours which succeed the extinction of animal life. Hence much of the vascular congestion and serous effusion seen after death from primary fever may be, and indeed almost certainly is, pseudo-morbid; at all events, equal congestion and effusion are frequently remarked after death from other causes, where there was clearly no affection during life, either of the brains, the lungs, or the intestinal canal. The last remark applies particularly to the congestion of vessels and effusion of serosity commonly observed within the head — appearances which have been imagined by one sect of non-essentialists to bear out their doctrine, that fever consists radically of cerebral inflammation. It also applies with equal force to the vascularity and submucous extravasation observed often in the stomach and intestines—to which single appearance the Broussaists are not unfrequently reduced, for evidence of their imaginary gastro-enteritis.

The morbid appearances which occur incidentally, or as secondary affections, during fever, are chiefly either the several effects of inflammation of the internal organs, or softening and friability of their texture from an unascertained cause. The frequency of secondary appearances must be stated very differently, according as we admit dothinenteritis to be a mere variety of ordinary fever, with a secondary disorder of the intestinal canal, or maintain that it is a distinct disease. If that affection be excluded, the secondary appearances observed in the dead

body are few and simple. In the fever of Edinburgh, for example, where inflammation and suppuration of the intestinal muciparous glands are rare, other morbid appearances are also, on the whole, not frequent. If, however, the abdominal disorder in question be regarded, not as a distinct disease, but as incidental to typhus, the number of pathological appearances, which must be included under the class of secondary phenomena, becomes very great; because that particular disorder never makes its appearance without being attended by very many others, secondary to itself, and involving important structural derangements. In treating of continued fever hitherto, dothinenteritis has been considered one of its secondary disorders. It will, therefore, be right to follow out the same doctrine in the present place, and to enumerate all the pathological appearances which have been indicated in fever, with this understanding of the meaning of the term.

[Dr. Alison, after observing the occasional entire absence, after fatal fever, of any appearances strictly morbid—that when found they are often remarkably various, even in cases, the leading symptoms of which are nearly the same—and that they are far from bearing any fixed proportion to the intensity of the symptoms of affection of the parts where they exist, says—"when found after fever they are almost uniformly indications of inflammation; but this inflammation is distinguished by two peculiarities; first, that it is seated very generally in certain textures only; and, secondly, that its effects are apparently more limited than in other cases, and in particular the effusions of coagulable lymph and of pus are often found to a very small extent, in comparison with what is seen in idiopathic inflammation of the same parts. Indeed there are so many fatal cases of fever, attended with evident local affections, and showing on dissection marks of local inflammation, in which no effusion of lymph or pus appears on dissection, that it may be suspected in the comparatively few cases where considerable effusions of these kinds have been described, that they had resulted from simple inflammation immediately succeeding, (as often happens,) to the fever, rather than that they had taken place during the fever itself."]

1. The *brain* and *membranes* seldom present any other deviations from the healthy condition than those already enumerated. Sometimes vascularity and effusion of serosity are attended with opacity of the arachnoid. This opacity is conceived by many to be a character of inflammation, but probably without sufficient reason. A more unequivocal character, but an extremely rare fact in the pathology of fever, is effusion of distinct lymph on the surface of the arachnoid. It is usual to find authors speaking in general terms of inflammation being seen in the cerebral mem-

branes. By inflammation, however, they generally understand vascularity and turgescence only. Now these appearances are altogether fallacious diagnostics of inflammation. Mere vascularity of the cerebral membranes can scarce be satisfactorily referred to inflammation, unless there are an extreme abundance and minute network of visible vessels occupying the superior as well as inferior parts in point of position, attended with an uniform pale rose or flesh-coloured blush, and by no means necessarily accompanied, indeed rather without, turgescence of the larger blood-vessels. These are the anatomical characters of cases of idiopathic meningitis fatal in its early stage; but such characters are very rarely presented by the congestive vascularity often observed as the only unnatural condition of the membranes of the brain after fever.

[Unusual engorgement of the sinuses and the larger vessels of the brain has been observed by most writers. Gerhard says these were filled, in his cases, with dark-coloured fluid blood, in some instances, in the large sinuses, surrounding a soft greenish coagulum. Injection of the pia mater is not uncommon; and the arachnoid, according to Larrey, is sometimes opaque, and covered with a false membrane. Serum is found beneath the arachnoid, and in the ventricles; of forty-three cases in which the brain was examined by Dr. Reid,* there was increased effusion of serum in twenty. This effusion in most cases, was situated between the arachnoid and the pia mater, and was commonly moderate in quantity, in many cases elevating the arachnoid above the surface of the convolutions only at the depending portions of the brain. Gerhard states, that in his dissections the medullary portion of the brain was frequently of a violet tinge; otherwise the substance of the organ was unaltered. In the spinal cord, similar appearances to those described in brain, have been observed. Compte has found not only the spinal meninges affected, but the cord itself injected and even softened. Though effusion beneath the arachnoid and in the ventricles is a frequent morbid appearance after continued fever, it is still to be found after death in cases where abundant cause of death existed elsewhere; it is very generally much less than in fatal cases of idiopathic inflammation within the cranium; and it is more frequent in old than young persons. All this makes it difficult to determine how far it is an effect of fever. Dr. Reid says, that the cerebral symptoms—delirium, coma, subsultus—were as frequently present, and as strongly marked in the cases where there was no increased effusion, as where there was.]

2. The part in which morbid appearances are most frequently found is the mucous membrane of the alimentary canal. The

* [Ed. Med. & Surg. Journ., Oct., 1839.]

pharynx exhibits sometimes superficial ulcers, more rarely suppuration and abscess of the submucous cellular tissue. M. Louis found the former appearance in one-sixth of his cases. The *gullet* is likewise often superficially ulcerated—a very rare observation in other diseases at large. The *stomach* is sometimes enlarged; softening, with attenuation of the villous coat, is common, having been found in a third part of Louis's cases; ulceration, marked by a sharp eroded border, is more rare; mammillated roughness very frequent; and each of these states is often attended with grayness, bluishness or redness of the surface, which may also occur as the sole unnatural appearance. These anatomical characters, which Broussais thought to be invariable, are very frequently altogether absent in the fevers of this country; and M. Louis has given his valuable testimony to their not unfrequent absence even in what he considers the only true typhoid fever of France—the dothinenteritis of Bretonneau. The *duodenal* mucous membrane is at times red, softened, or even superficially ulcerated. The remaining *small intestines* are usually distended with gases, and contain a good deal of mucus, sometimes sanguinolent, more frequently bilious. Their mucous coat is white in cases quickly fatal, red at a later stage, gray in old cases, and frequently softened; but by far the most remarkable, and also (taking fever in the generic sense, as comprising continued fever of all countries), their most frequent morbid condition, is inflammation of the solitary and conglomerate glands, which are scattered over the course of the small intestines, and which especially abound near the ileo-cæcal valve. The early stage of this organic affection consists of redness, thickening and softening of the glands, with sometimes a deposition of friable matter in the adjacent submucous tissue. Afterwards the surface becomes bluish-gray or ulcerated; and at a later period the ulcers are found to have spread, and sometimes put on a ragged, fungoid margin. Frequently a depression is seen, and over it a fine transparent pellicle, presenting the appearance of an ulcer which had healed. The isolated glands of Brunner are more rarely affected than the conglomerate glands of Peyer. Sometimes a perforation is seen at the bottom of an ulcer, together with the usual characters of peritoneal inflammation. The greatest amount of disease is commonly found near the ileo-cæcal valve; and, in most cases, it is confined to the lower eighteen inches of the ileum. Ulceration is seldom observed, unless life has been prolonged beyond the fifteenth day of fever. The *colon* is, for the most part, distended with gases like the small intestines, and presents the same variety of structural derangements. In particular, the mucous cysts are frequently enlarged; and ulceration is so common, according to Louis, as to be observed in a third part of the cases.

[In all the cases reported by Dr. Gerhard, in the Philadelphia

epidemic of 1836, the mucous membrane of the stomach was more or less altered. The most common alteration was softening at the cardiac extremity; this was sometimes extensive; and sometimes limited to a small portion of the membrane. It varied in degree from diminished consistency to pulpy disorganization. All the coverings of the stomach were, in some instances, involved. A mammillated condition of the mucous membrane, especially towards the pyloric orifice, was not uncommon. In some cases there was blue engorgement of the large veins; in some a pointed redness; and in others a continuous dull slate colour of the mucous membrane. The intestinal canal was singularly exempt from any lesion; occasional patches of ecchymosis being all that was observed. Of all the autopsies there was but one, where there was any deviation from the natural appearance of the glands of Peyer. In the case alluded to, in which there had been some diarrhœa, the agglomerated glands of the small intestine were reddened and a little thickened; but there was no ulceration, and no thickening or deposit of yellow puriform matter in the submucous tissue. The disease of the glands resembled that sometimes met with in small-pox, scarlet fever, or measles, rather than the specific lesion of dothinenteritis. In all other cases, the glands of Peyer were remarkably healthy in this disease, as was the surrounding mucous membrane, which was much more free from vascular injection than it is in cases of various diseases not originally affecting the small intestine. The mesenteric glands were always found of the normal size, varying, as in health, from the size of a small grain of maize to three or four times these dimensions. With the exception of a slightly livid tint, common to them and the rest of the tissues, they offered nothing peculiar either in consistence or colour. The spleen was of the normal aspect, in one-half the cases; in the other half, it was softened, but not enlarged, and in one case out of five or six, enlarged and softened. The liver was found sometimes moderately softened; sometimes engorged with dark, fluid, oily blood, and sometimes spotted with ecchymosis. In many cases, however, it was the seat of no appreciable lesion. The contents of the gall-bladder differed in different cases: in some the bile was viscid; in some it was thick, dark, grumous, and so on; in others it was healthy. The kidneys, in some instances, were of a darker colour than natural, but commonly they were free from disease."

In the cases examined by Dr. Shattuck, in the London Fever Hospital, the glands of Peyer, and the mesenteric glands were healthy. Of thirty-three cases examined by Dr. Reid, in the Edinburgh Infirmary, only two presented the follicular lesion, and these doubtfully. Dr. Villars, in a description of an epidemic

* [Am. Journ. Med. Sciences, 1837.]

typhus which prevailed at Toulon in 1833, positively asserts that the glands of the intestines were free from disease. Fleury, Heraudon, Pellicot, in various publications hold the same language. Dr. Alison says, the complication, though rare in Edinburgh, is common in London.]

3. The *serous membranes* seldom present distinct signs of disease. Serous effusion into the cavities, it is true, seems not uncommon; but the amount is inconsiderable, and such as may well arise from pseudo-morbid operations. Louis met very rarely with either pleurisy or pericarditis; and this is consistent with the observation of British physicians. Peritoneal inflammation is sometimes presented in the shape of redness and opacity of the peritoneum, lymph spread over it, and sero-purulent matter in its sac; but this condition is extremely rare, except in consequence of perforation of the intestines by an ulcer from within.

4. The *glandular system* is frequently affected. The subcutaneous lymphatic glands sometimes present induration and enlargement, and most frequently in the neck and axilla. These bodies, however, are, on the whole, seldom materially diseased comparatively with the lacteal and lymphatic glands of the abdomen. The lymphatic glands of the stomach are at times enlarged, as also occasionally those which lie adjacent to the biliary ducts. The mesenteric glands are always more or less affected, wherever the mucous glands of the intestines suffer. The earliest marks of disease are some enlargement, or friability, and pale redness; at a more advanced stage there are greater enlargement and dark redness; and at length, in the most advanced cases, the glands are filled with pus. The mesocolic glands are subject to the same pathological alterations. Sometimes both the mesenteric and mesocolic glands are diseased, where the intestinal mucous glands are healthy.

Of the *great viscera*, the spleen is very generally found much softened, of a dark bluish-black colour, and much enlarged. The liver is more rarely enlarged, softened and friable, with unusually fluid bile, and at times redness of the lining membrane of the gall-bladder. The kidneys are at times softer, and darker than usual, and the bladder red internally. The heart is often dark, dry and softened, occasionally to such a degree as to be easily torn, and to retain, like dough, the impression of the fingers; its cavities contain usually little blood, and, whenever its parietes are softened, the blood is in loose clots, without separation of fibrin or fluid, and mixed with air-bubbles. This condition of the heart always corresponds with a hurried, feeble, fluttering pulse during life. The lungs are frequently quite healthy, sometimes partially gorged with red serum, or partially hepatized; the bronchial tubes usually contain a good deal of mucous fluid, and are dark-red in colour;

and the epiglottis, glottis and larynx occasionally show redness and thickening of their lining membrane, but very rarely erosion or ulceration.

The secondary morbid appearances, of which the preceding narrative presents a succinct list, are derived principally from the able pathological directions of M. Louis, who is universally acknowledged to have given the best view of the pathological anatomy of the disease as it occurs in Paris. His account corresponds closely with the descriptions lately given of that variety of the London typhus, which is complicated with affections of the bowels, and which will be found fully described in the writings of Drs. Bright, Tweedie, and Burns.

The multifarious appearances of organic derangement thus indicated are, however, by no means common to all fevers, or even to all forms of typhus. On the contrary, very many instances of true typhus are to be met with even in London, where no marked morbid alteration of structure is to be seen at all, further than the signs of congestion or of immaterial serous effusion. As to the fever which has prevailed in Edinburgh for twenty years past, and in which serious bowel affections are in general very uncommon, it is certainly rare to witness any of the more prominent appearances so frequently seen by M. Louis and his countrymen. Even where signs of local disturbance of function existed during life, it is rare to observe distinct structural changes after death; turgescence of vessels, and serous effusions to a limited extent, are the only general appearances; an unusual accumulation of mucus in the bronchial tubes is not uncommon; and, in a few instances, redness and effusion of lymph have been observed on the pleura. In particular, it is rare to find any unnatural condition of the intestinal mucous membrane, so constantly observed in France; frequently the entire tract of the alimentary canal is quite healthy; and the only appearances at all familiar, are various forms of redness, sometimes with softening, gray discoloration, and attenuation. The various remarkable appearances of softening of the viscera, indicated by M. Louis as of frequent occurrence, are here extremely rare. It seems reasonable to conclude, that the signs of structural derangement, ascribed by M. Louis to typhoid fever generally, are most of them peculiar pathological states, secondary not to fever in general, but to one of its secondary disorders —inflammation of the mucous glands of the intestines.

The most interesting of these structural derangements is undoubtedly the softening, which is invariably observed in one or more of the great viscera in all cases where life is prolonged for a moderate number of days. It is a secondary or consecutive affection, is seldom observed until the intestinal disorder has had time to develop itself fully, and is most marked in the cases where

that disorder has advanced to suppuration and ulceration. Its precise nature is not ascertained; but M. Louis is convinced it has no connection with inflammation of the structures it invades; for, indeed, the organ which presents it, is generally softened throughout and equably, and does not show any one of the familiar pathological characters of inflammation in other circumstances. It is the frequent cause of death, especially when it invades the heart; and the symptoms it produces are those of extreme depression of the circulation, and typhoid exhaustion.

VI. CAUSES.

One of the most melancholy proofs of the uncertainty of medical doctrine, is the doubt still entertained by many estimable members of the profession respecting the causes of fever. Opportunities of investigation have for many centuries abounded to a greater extent, perhaps, than upon any other question in medical science; the most eminent authorities in medicine have employed these opportunities with zeal and acuteness; and, nevertheless, in the most enlightened parts of Europe, a division of opinion prevails on some most essential departments of the subject. But, after all, this division of sentiment arises as much from the different conformation of the human mind, as from any obscurity or contrariety of the facts. The peculiar sentiments of some have indeed been formed from peculiar opportunities of observation, from the observation of anomalies, which they have incorrectly regarded as the general rule. Yet it must be admitted, that the greater proportion of the discrepant doctrines of the present day, as to the origin of fever, are founded essentially upon the same great body of facts.

While these discrepancies must be admitted and deplored, it does not appear that they are altogether so important or so discreditable to the reputation of physic as its maligners will insist. For the opinions of the great majority of scientific physicians are in accord on most of the essential points of doctrine; and the deviations occasionally observed should be regarded as in no respect different from the occasional dissents which take place every day in the conclusions formed by juries on questions of common life, which to most minds seem free of all ambiguity.

The great questions involved in the investigation into the causes of continued fever are three in number:—Does the disease originate in infection? Does it originate in other causes? Granting that it does originate in other causes, may such fevers propagate themselves by infection? These questions will be considered in the order here laid down. It will be seen that they cannot be all answered by any means with equal confidence.

1. Infection.—By far the most important question relative to the causes of fever regards its origin in infection, or contagion. As these terms are used in various senses, it may be well to observe, that, in the following remarks, contagion will be used in the sense of communication by contact, and infection in that of communication by the medium of effluvia or atmospheric poison. But indeed the former term may be discarded at once from the inquiry, with the simple statement that there is not a vestige of evidence to prove that actual contact is necessary for the transmission of any one febrile disease from the sick to the healthy—least of all, certainly, for the transmission of continued fever. Nor is it easy to see how anything like certainty, or even a strong presumption, is to be attained to on such a question. Science would gain by the abandonment or limitation of both terms now in use, and by the adoption of the generic term "communication," to denote the mere passage of disease from the sick to the healthy, without involving at all the question, in what way the passage is accomplished.

In the British Islands probably not above one physician in fifty entertains any doubt of the infectious nature of continued fever. In France, and also in Germany, on the contrary, the opposite doctrine is at the present time prevalently adopted, though not by so preponderating a majority. It would be desirable to fix, if possible, the causes of so singular a discrepancy of sentiment and to find out whether the disease really differs in its characters, or the difference lies only in the disposition of men's minds. But such an inquiry would lead to a long argument, which would be misplaced in a work like the present. It must suffice then to set out with stating the general proposition, that the British doctrine seems well founded in respect of the fever which prevails in Britain and Ireland, and to attempt establishing this doctrine by irrefragable facts.

Great advantage will be derived from conducting this inquiry with reference to bodies of men, rather than to solitary cases, on which the supporters of the doctrine of communication have been often too prone to rest their cause. Individual cases, however conclusive to appearance, are open to many sources of fallacy, which it is impossible to guard against so thoroughly as to avoid the risk of error—much less to overcome the hesitation of over-cautious or reluctant understandings. Facts derived from groups of cases come with a force which no reasonable mind, however sceptical, can honestly resist. The arguments to be stated upon this principle will be drawn chiefly from direct personal observation of the fever of Edinburgh for many years past. Equally pointed facts might be obtained from the history of epidemics of fever in other large towns. But perhaps they have never been ascertained with such precision, or under cir-

cumstances so favourable for securing their conclusiveness, as in Edinburgh during the twenty years subsequent to the first great eruption of fever in 1817.

The first argument in favour of infection may be found in a general survey of the history of fever in a district for a considerable term of years. In the rural part of the district it is seen to be always comparatively rare, and scarcely ever, properly speaking, epidemic; while in large towns it is never entirely absent, and often puts on the form of a wide-spread pestilence, which extends its ravages wherever human beings are most crowded together, and most exposed to breathe a confined atmosphere. When it becomes epidemic in a large town, it never bursts forth with impetuosity, like diseases of undoubted miasmatic origin; but extends gradually, and always the more slowly the larger the city, so that many months may elapse before it reaches its full height. In this condition it remains only for a limited time, the length of which is proportioned to the size of the city, and governed by the circumstance that a certain moderate proportion of a population is at any one time susceptible of infection, so that the disease must at length exhaust the constitutions liable to invasion. It consequently then begins to decline, retires as gradually as it commenced, and finally resumes its natural condition, affecting only a few individuals here and there, and at distant intervals. A calm succeeds, and fever is almost forgotten. But in a few years its favourite haunts are occupied by a fresh population, with many susceptible constitutions. Under favour of co-operating circumstances it again emerges from obscurity to resume its epidemic devastations, and passes a second time through the same cycle of changes, and commonly in the same interval of time. In these successive revolutions no connection can be traced with season, temperature, moisture, winds, barometric pressure, or any appreciable atmospheric condition. This general history, even excluding details, appears irreconcilable with any other supposition, than that the disease is transmitted by communication from the sick to the healthy.

But secondly, on entering into the details of a particular epidemic, new arguments of great weight may be obtained from the general history of its progress. Thus fever is found to spread at first, not by scattered unconnected cases occurring at a distance from one another, but by slow degrees around one or more invaded localities as *foci*—first creeping from one individual to another in a family, then from family to family, according to their proximity, relationship, or general intercourse, and at length to the surrounding population promiscuously, with the exception of the better ranks. It may often be difficult to trace out these facts with accuracy, partly on account of the great length of

time the infection often lies latent before the disease breaks forth, partly by reason of the apathy of the order of society where chiefly it prevails, and their natural forgetfulness of what is passing even in their immediate vicinity. But at the beginning of an epidemic, before the question is complicated by the establishment of secondary foci for the disease, it may be always ascertained, with proper pains, to spread gradually to the neighbourhood of the sick in the first instance.

But a further argument of very great weight may be drawn even from the very violations of this general rule. For sometimes the disease is seen suddenly to arise, and gradually to spread, in parts of a town where it had not previously existed; and this in concurrence with the arrival of the disease by importation from a previously invaded locality. It may indeed be objected, that the new eruption of the disease is merely an accidental coincidence with the communication which has been held with the invaded locality, and not its real consequence; that this constitutes nothing more than one of the solitary or individual facts, which were admitted above to be fallacious. But then there are instances where, after direct simultaneous communication with the disease in an invaded locality, several new foci are established at one and the same time;—a concurrence which can scarcely be supposed to be the result of accidental coincidence, because, according to the doctrine of chances, it is in the highest degree improbable. Or, instead of several simultaneous foci being formed by the communication of several individuals at the same time with the disease at a distance, there may be several established consecutively in new and remote localities by the same individual, passing from place to place while ill of fever—a conjunction of circumstances which is not less improbable as the result of accident merely. Pointed facts of both these kinds have been selected by Dr. Alison (*Edin. Med. Journ.*, xxviii. 233), and might be encountered much more frequently towards the commencement of an epidemic, if observers were to carry on their investigations with a more thorough knowledge of the nature of evidence than is usually brought to the inquiry.

A fourth argument, more powerful perhaps than any other, and upon which alone the doctrine of the communicability of fever might be rested, is, that in circumscribed localities inhabited by crowded bodies of men, fever is observed invariably to spread among the healthy, when it is introduced to a great extent from without, but never materially at any other time. This is a general mode of expressing the history of such institutions as infirmaries and fever hospitals. During the last twenty years the Infirmary of Edinburgh has been made the receptacle of a large proportion of fever cases in three epidemics, which have lasted between

three and four years; and there have been two intervals varying from three to five years in duration. During the intervals when fever cases from without were few, fevers originating within the hospital were extremely rare among any classes of individuals attached to its service. But during the prevalence of the several epidemics, fever abounded in every department of its service: physicians, clinical clerks, general servants, nurses, washerwomen, apothecary's assistants, all suffered more or less, and some to an excessive degree. The same facts were observed even more remarkably in an institution, which was, during the same interval, occasionally occupied as a fever hospital. In three epidemics it was made use of for this purpose; and, at various periods during the last twenty-five years, it has also been occupied, when fever did not prevail epidemically in the city, by crowded bodies of men, first by soldiers as a barrack, then as a retreat for some hundreds of poor people who were turned out of their houses in the winter by an extensive fire, next as a quarantine house during the prevalence of cholera, and, for some years past during the worst epidemic of fever which has yet prevailed in this city, it has been occupied by about 300 of the very lowest of the community, namely, as a house of refuge for vagrants and other destitute persons. Now, on each occasion when it was occupied as a fever hospital, the people on service in the institution suffered to an extraordinary degree, scarcely a single individual escaping an attack who remained a moderate length of time in it. But, on other occasions, fever was either absolutely unknown, or the cases were rare and distant, and easily referable to the particular manner of life of the individuals composing the population of the establishment. It is also worthy of notice, in reference to both chains of facts here mentioned, that neither around the infirmary, nor around the late fever hospital, did fever ever prevail to any material extent during any of its epidemic visitations. These remarkable facts seem to set at rest the question which has been agitated by some bigoted non-contagionists, Whether the prevalence of fever in such circumstances may not be owing to some very peculiar circumscribed miasma? For here the local miasma must be held to be circumscribed by the very foundation-walls of the buildings, to affect those buildings alone of the numerous institutions of a similar kind throughout Edinburgh; to be developed by fortuitous coincidence on three or four successive occasions, when fever patients happened to be brought in numbers into them; and to be cleared away by the same incomprehensible accident on repeated occasions, exactly when fever cases cease to be accumulated from without. How any individual in the possession of understanding, and aware of the import of evidence, can resist such proofs as these, and continue to deny that fever is communicable, appears utterly incomprehensible, unless he call

in question the special facts? These, however, are familiar to hundreds. It would be out of place to detail them numerically here; but a part of them may be seen in the statistical form in the paper of Dr. Alison already quoted.

The fifth and last argument, and one little inferior in force to that just laid down, is, that in hospitals where fever patients abound, the proportion of attacks among the people on service is in the ratio of their exposure to the emanations from the sick. Nurses are most exposed, and accordingly suffer most; in Edinburgh not a single fever nurse escapes who remains long enough at her post. In 1818 Dr. Welsh, then superintendent of the Fever Hospital, found that of thirty-eight nurses all were attacked except two or three, who had been but a short time in the institution, (*On Blood-letting in Fever*, p. 45,)—a statement which the writer is able to confirm, having at the time been a resident clerk. Next in order came the resident clerks or house surgeons, who have charge of fever cases, and whose peculiar risk consists in their duties calling them to make minute personal examinations of the patients at all times, but especially on their first admission, and generally to spend much time in the atmosphere of fever wards. Accordingly few of them escape fever long. Of fifteen gentlemen, who held between 1817 and 1820 the offices of house-surgeon, or resident clerk, in the Edinburgh Infirmary and Fever Hospital, two only escaped an attack; and during seventeen months of the period, when the epidemic was at its height, there occurred sixteen cases of fever among ten of these, of whom five had it once, four twice, and one thrice. The third rank in point of exposure may be assigned to dressers and house-servants, who, according to the practice pursued in Edinburgh, are not much in communication with fever patients, but who, when this does occur, communicate with them closely. The proportion of seizures in this class is much less than in the two former, but still quite sufficient to attract observation, as distinguishing them from those whose exposure is still less. The precise number it is unfortunately impossible to ascertain. The next place may be assigned to the medical students of hospitals, not attached to the service of the institution. Here the exposure is for the most part insignificant, because few general students examine the cases of fever with minuteness: accordingly few suffer. In the early epidemic of 1817–20 in Edinburgh, when the resident clerks suffered so severely, fever was absolutely unknown among the general class of hospital pupils, because at that time the disease was new as an epidemic, and held in wholesome dread; so that the physicians of the infirmary were commonly deserted in their rounds, when they arrived at the doors of the fever wards. Now, however, fever is a more familiar visitor; the fever wards and fever patients are approached by most without hesitation, and by some the cases

are examined with care and minuteness. Accordingly a few instances of fever are every now and then presenting themselves in the present class, but nevertheless far fewer proportionally than in any other denomination of persons yet mentioned. In the winter of 1836–7, among sixteen gentlemen in charge of the general and fever patients of the university clinic, there occurred nine cases of fever; while among their fellow-students of clinical medicine, 140 in number, who had no particular charge, there were only four attacks. In conclusion, and in contrast to all these circumstances, may be taken the condition of other bodies similarly situated in every other respect, except that they are not exposed at all to the concentrated fevers of a hospital. And, to avoid all ambiguity, let the attention be confined to such as occupy the same station of life, and follow the same pursuits with those who have been seen to be so very liable to fever under exposure, namely, to medical pupils not in attendance upon any hospital where fever cases are collected together. Here the chain of evidence is found to constitute an uninterrupted succession of links. In 1817–20, when the disease prevailed so extensively among the few medical pupils attached to the service of the hospitals, it was wholly unknown among seven or eight hundred medical students, who did not come in contact with fever; and in 1836–7, when it occurred severely among clinical clerks, and to a slight degree among the general clinical pupils, on the most careful inquiry it was ascertained that among 500 or 550 medical pupils, not clinical, only two cases had occurred in six months, both of whom were much in contact with fever in the houses of the poor in the capacity of pupils to a public dispensary.

Little doubt can exist, that the history of other hospitals and other schools might furnish similar facts equally interesting and not less conclusive. But there are circumstances in regard to the institutions of Edinburgh, which it is needless to dwell upon, and which tend to place the evidence of such general facts in a very strong and unequivocal light. Other general facts of the same nature might be drawn from the experience of the Edinburgh hospitals. It may be sufficient to mention two only. It has been invariably remarked, that the admission of a few fever cases into a general ward is attended with little or no risk of the fever passing to the other inmates of these wards. But so soon as the cases exceed considerably a third of the whole, then the fever begins to show itself among the domestic attendants, and to appear among the other patients. And if a convalescent from some other febrile disease is allowed to remain in a fever ward, he is attacked with fever almost invariably. The only other general fact of the same purport requiring mention is, that in a pure fever hospital extremely few of the inmates of any denomination escape. This fact has been adverted to in a former statement.

Laws of Infection.—The communicability of fever from the sick to the healthy being thus put beyond all possibility of question, it becomes an object of great consequence to determine the rules by which its communication is governed. A good deal of vague statement has been published on this subject; and the *laws of contagion*, as they have been boldly designated, have been promulgated with considerable confidence. Much fallacy and error, however, have crept into the inquiry towards determining these rules, partly because too much reliance has been placed on conclusions drawn from solitary facts occurring in the instance of single individuals, and partly because various communicable or infectious diseases have been mingled together in the investigation. Confining the attention to continued fever, as it appears in the British Isles, the following general propositions seem well established:—

1. All the forms of primary continued fever are communicable, and probably in an equal degree. It is generally thought that synocha, or pure inflammatory fever, is an exception; and even some unhesitating contagionists incline to this opinion. Such certainly seems to be the case in hot climates; and such seems probably also the fact with the ephemeral synocha of temperate countries. But there can be no manner of doubt, that the inflammatory fever described above, as prevailing with synochus and typhus in the epidemic form, is capable of being transmitted from the sick to the healthy. It was seen to do so unequivocally in Edinburgh between 1817 and 1827, when it was at different times prevalent, one type of fever seeming to produce all types indiscriminately. In a considerable proportion of the resident clerks of the hospitals, the disease assumed the pure inflammatory form; and the same fact was also observed, though not to so great a degree, in the instance of young adults generally.

[The contagious nature of the epidemic fever of Scotland during 1843, was not doubted by any of the writers of the various notices of it; and numerous and satisfactory proofs of this fact are recorded by them.]

2. Very great differences exist between different individuals, as to their liability to fever under exposure to it. Some are seized soon after slight exposure, others only after several months of close communication with the sick, and a few seem proof against infection altogether. The experience of fever-hospitals, however, in epidemic seasons, renders it probable, that the immunity apparently enjoyed by some is only relative, and not absolute; for it has been seen above, that in a fever hospital during an epidemic every individual without exception is seized, sooner or later, who remains long in the establishment. Continued fever, therefore, is probably communicable to all constitutions.

[Why healthy individuals, well fed, and cleanly, are more susceptible of contagion at one period than another, is totally unknown. Vaccination sometimes succeeds after four or five unsuccessful trials; and unprotected physicians may pass through several epidemics of scarlet fever or measles, unscathed, and yet finally contract the disorder. Dr. Bancroft says, "that among ninety-nine orderlies and nurses who had probably not been exposed to the contagion before their attendance on the sick commenced, the earliest attack was on the 13th day, and the latest on the 68th; but these returns were made up on the 20th of April, and it appears that some who had escaped at that time were afterwards attacked; and therefore, though there may be reason to conclude that febrile contagion does not remain inactive so long after being received into the body as marsh miasmata, I see none for believing that an interval of five or six months may not sometimes elapse before the actual production of fever by it."* Dr. Perry is of opinion that the earliest period of the disease making its appearance after exposure to contagion is eight days, more frequently fourteen, and sometimes so long as two months.† Dr. Barker says that the latent period of the contagious principle seems to extend to two or three weeks.

Dr. Tweedie notices the exemption of butchers from fever, and states that though almost every description of mechanics was admitted during the year into the London Fever Hospital, he did not recollect of a single instance of a butcher.‡ Other physicians, however, have met with patients who followed this occupation. Dr. Southwood Smith, in his table of the occupations of 679 patients affected with fever, enumerates three butchers, two curriers, and two skinners.§ Dr. Craigie, in his table of 181 cases of fever treated in the Edinburgh Royal Infirmary, mentions three butchers among that number.‖

Persons affected with chronic disease of the chest or abdomen, seldom contract with typhus. Hildenbrand says, that phthisical persons are rarely attacked with typhus. Dr. Davidson states, that of 100 post-mortem inspections of fever, he had met with only three cases of tubercles; and that their number in each did not exceed three, which were small and only partially softened. J. Frank, on the contrary, places phthisis among the predisposing conditions. *Facile suscipiunt qui febribus intermittentibus, phthisi pulmonali, scorbuto et syphilide laborant,* (*Praxeos Med.*, t. iv. p. 98)—are his words. With respect to scurvy, Dr. Boudin maintains that it is a preservative against typhus, and relates

* [Bancroft on Yellow Fever, p. 516.]
† [Ed. Med. and Surg. Journ., vol. xlv. p. 69.]
‡ [Tweedie's Clinical Illustrations of Fever, p. 79.]
§ [Southwood Smith's Treatise on Fever, p. 431.]
‖ [Edinb. Med. and Surgical Journal, vol. xlvii. p. 286.]

several facts, which go far to sustain his opinion. He states that, after the battle of Navarino, on board the hospital ships, the only persons who escaped the fever, were those labouring under scurvy. Lind (*An Essay on the means of preserving the health of seamen.* London, 1774, p. 195), expresses the same opinion, and mentions an instance strongly confirmatory.]

3. The infection of continued fever is for the most part by no means virulent. This is contrary to universal prejudice among unprofessional persons, and to the opinion entertained even by some members of the medical profession. But it is nevertheless certain—so far as minute observation of several violent epidemics during the last twenty years can determine the point—that moderate precautions will render the infectious atmosphere inert. Cleanliness and ventilation will speedily extinguish any epidemic. For it is well ascertained, that fever communicated to an individual in the better ranks by attendance on the sick in hospital, is very rarely propagated in his own station, or to any of his attendants. Among numerous instances known to the writer, of young practitioners and medical students who have caught fever in the prosecution of their practical studies, not a single case has occurred where the disease was communicated in their families at home or in their lodging-houses.

[The contagious matter is readily diffused through the air, and loses its poisonous quality by dilution, so that, at a distance of twenty or thirty yards, air which has passed over the bodies of persons ill of continued fever, is innocuous.]

4. On the other hand, infection operates with very great certainty wherever cleanliness and ventilation are neglected. Hence the ravages it commits among the poor. Hence, especially, the extraordinary devastations it commits among the low lodging-houses of great towns. Even in the better ranks of society, the same co-operating causes will make it spread. In an instance where the disease was introduced into a family in good circumstances, the mistress of which was slovenly and a fatalist in her notions, no fewer than seven children were attacked in succession in the course of six weeks.

[Filth and deficient ventilation tend powerfully to spread the contagion of typhus; where it is concentrated, as in hospitals, or in the small, ill-ventilated houses of the poor, it rarely fails to be communicated to the unprotected attendants, or inmates. Personal filthiness, though doubtless rendering the morbid effluvia more contagious, does not exercise, by any means, as decisive an influence as deficient ventilation. Dr. Bateman, after describing the method to be adopted for promoting cleanliness and sufficient ventilation, remarks:—"During the fourteen years, in the course of which I have almost daily been in contact with persons labour-

ing under contagious fever, not only myself, but all the nurses, have thus been preserved from infection, with one exception, down to the period of the present epidemic." He adds in a note: "It is no disparagement to the system above described that some of the nurses and the matron of the House of Recovery have been infected during the present epidemic, which has kept the wards constantly full. The impossibility of maintaining a free ventilation night and day, during the cold weather, their perpetual exposure, in close contact, to the breath and discharges of the patients, while feeding, moving, or washing them, changing their beds and linen, and even stripping off their infected clothes on admission, might be sufficient to counteract the solitary operation of any general system, however efficacious. But the truth is, that the ventilation of the house has been very imperfect, and even at the command of the nurses and patients; and the injurious consequences of this imperfection have become so manifest, that the subject is now under the consideration of the committee, while this work is in the press."* Dr. Hancock quotes the following facts, which illustrate very powerfully the influence of ventilation:—"In the year 1819, I had occasion to see a very intelligent physician, connected with one or two fever hospitals in Dublin, during the epidemic, who assured me he had seen no proof of the existence of contagion in the disease (typhus) as it appeared in those institutions under his care, where very great attention was paid to ventilation, and where the patients were not inconveniently crowded. But soon after this, I saw another physician no less intelligent, who informed me that in the course of about four months, between 200 and 300 persons were admitted into the Belfast Fever Hospital; and they were frequently so crowded in the wards as nearly to cover the floor with their beds; in which case, although the building is new, airy, and well regulated, the matron, twenty-two nurses, and the apothecary took the disease; yet it was so mild, that scarcely more than one in fifty died."† Dr. Prichard relates a striking example of the effects of a good as well as of a deficient ventilation, which occurred in two of the hospitals in Bristol, namely, St. Peter's and the Bristol Infirmary; both of these institutions being under his medical superintendence. "In the former, (St. Peter's,) the medical wards are very small, and it was necessary to place the beds very near to each other, and to put too great a number of patients in a given space. Offensive smells were often perceptible; and it was under these circumstances that the disease was manifestly contagious." In the Bristol Infirmary the wards are lofty and well ventilated. Here, also, the fever patients were dispersed among invalids of

* [Bateman on Contagious Fever, p. 154.]
† [Hancock on Pestilence, p. 339.]

almost every other description. But no instance occurred of the propagation of fever; none of the nurses were attacked, nor were the patients lying in the adjacent beds in any instance infected, though cases of the worst description of typhus gravior were placed promiscuously among the other patients, scarcely two feet of space intervening between the beds.* Drs. Barker and Cheyne relate another remarkable proof in Sir Patrick Dunn's Hospital of a ward, by the peculiarity of its construction, protecting the attendants upon the sick from the effects of contagion. Drs. Barker and Cheyne remark, in that portion of their report which has been already quoted, that typhus generally spreads in the families of the lower classes and very rarely in those of the superior ranks. Dr. Cowan states that "the fever was chiefly, nay, almost wholly, confined to the labouring classes and to the districts which they inhabited, while among the wealthy and middle classes of society it was comparatively seldom met with, and when it did occur, was not spread by contagion through all the inmates of the family, as was usually the case among the families of the poor, but was confined to a single individual."† These results, as stated by the above-mentioned authors, agree, we are convinced, with those which have been made in almost every other place. "This remarkable difference, in the two classes of persons referred to," says Dr. Davidson, "must be owing chiefly to the wide diversity of circumstances in which they are placed; and approximates very closely to the difference which exists between a crowded, and, consequently, an ill-ventilated hospital, and one which is limited to a small number of patients with thorough ventilation. The lower classes in large cities generally live in dirty ill-ventilated houses, and are often filthy in their persons; while the better ranks live in more airy situations, have larger houses, and are more attentive to cleanliness in their persons and domestic habits; hence the effluvium which issues from a typhus patient, in the first-mentioned situations, cannot be carried off so readily, or diluted to the same extent with atmospheric air as in the second."‡ Dr. Marcet once collected a number of cases of typhus into one of the wards of Guy's Hospital, for the purposes of clinical instruction, when all at once the disease began to spread to other patients, and to the nurses, although it had not done so when the cases were distributed throughout the hospital, and it ceased to do so when they were again divided.]

5. One attack of fever is in some measure a protection against subsequent communication of the disease. An erroneous notion

* [Hancock on Pestilence. Prichard's History of the Fever in Bristol, p. 88.]

† [Cowan's Vital Statistics of Glasgow, p. 34.]

‡ [Thackery, Prize Essay, loc. cit.]

has prevailed, that one attack is a complete defence ever afterwards; but numberless facts prove the contrary. The history of fever hospitals shows, that the same individuals are frequently attacked in more than one epidemic, or even twice in the same epidemic; fever nurses very often have the disease twice at least; the writer of this article has had it six times while attending the fever wards of the infirmary or fever hospital; and Dr. TWEEDIE, physician to the London Fever Hospital, has had it three times. Nevertheless, a majority of those who have had one decided attack referable to infection, are not liable to suffer afterwards; and the protective influence of the first attack is even shown in some measure in the instances of those who do suffer a second time, by the longer exposure, which seems always necessary for the infection to take effect.

[Typhus generally attacks individuals but once during their lives. The exceptions met with are occasional, and do not interfere with the truth of the general proposition. It is known that small-pox, measles and scarlet fever, which, it is conceded, attack individuals but once, sometimes return, especially at epidemic periods. Dr. LOMBARD, of Geneva, when describing the difference between the continental and British typhus, says, that "in one remarkable point, however, I believe they agree, I mean the fact that no one is known, or at least is very rarely known, to have the eruptive typhus twice. With us such instances are scarcely if ever met with, and I am informed that with you a person once attacked with typhus, attended with the measles-like eruption, may safely calculate upon immunity from the disease for the future."* Dr. PERRY, of Glasgow, declares, as one of his conclusions respecting typhus fever, that, "contagious typhus is an exanthematous disease, and, like small-pox, measles, and scarlet fever, during its course produces some change on the system, by which the individual having once undergone the disease, is (as a general rule) secured against a second attack, and may with impunity expose himself to the contagion of typhus, if he continues to reside in the same country in which he previously had the disease. In those cases which are exceptions to the general rule, the disease appears in a mild and modified form, the crisis taking place on the seventh, ninth, or eleventh day." The same author remarks, that this conclusion as well as the others in his paper, are "the result of careful observation in upwards of 4000 cases."† Drs. BARKER and CHEYNE, who had the most extensive opportunities of ascertaining the history of typhus, seem to entertain opinions similar to those already quoted. They state that "at the hospital in Cork street, only one physician and the apothecary had an

* [Dublin Journal of Medical Science, vol. x., p. 22.]
† [Ed. Med. and Surg. Journ., vol. xiv., p. 67.]

attack of fever; but then most of the physicians of the establishment had laboured under that disease on some former occasion, previous to the appearance of the epidemic."* Dr. Cowan, as already quoted, mentions that all the gentlemen who have acted as clerks in the Fever Hospital for many years past have been attacked with fever, unless they had it previously to their election. Hildenbrand's opinion on this subject is of a more modified kind. He observes that "the miasma of typhus, after having produced the fever, destroys almost always, for a certain time, the susceptibility to a similar contagion; nevertheless, it destroys it rarely for the whole of life, as do small-pox, measles, &c. It has, however, under this resemblance, some analogy with the virus of these diseases, whilst on the contrary it totally differs from the syphilitic virus, which, when once introduced into the human body, always favours more and more a similar contagion."† The following table shows the answers to questions which were carefully put to patients who were admitted into the Glasgow Fever Hospital from November 1st, 1838, to November 1st, 1839. It includes the whole of the patients affected with eruptive typhus, from whom answers were obtained relative to any former affection with fever, as evidence from decided cases only could be made available in the elucidation of this point:

	Males.	Females.	Total.
Not previously affected	284	251	535
Previously affected	33	41	74
			609

"This table shows that out of 609 eruptive or decided cases of typhus, there were only 74 persons who stated that they had previously laboured under fever. This part of the evidence may be reckoned positive; for individuals of all intellectual capacities remember a remarkable circumstance of this kind. On the other hand, the evidence respecting the nature of the former fever or affection is the converse of this; for only in a very few cases can it be correctly ascertained; and when we take into account the various diseases which are confounded with typhus, (as shall be afterwards shown,) such as bronchitis, pneumonia, pleurisy, intestinal affections, febriculous or short fevers, and the numerous ailments of childhood, this small number can be satisfactorily accounted for. It appears, therefore, that the evidence which can be produced to bear on this point, although not very extensive, decidedly supports the opinion that eruptive typhus fever affects individuals, as a general rule, only once in their lives; and it is to a considerable extent corroborative of this opinion, that almost all

* [Barker and Cheyne on Fever, vol. i., p. 135.]
† [Hildenbrand, p. 75.]

the clerks and nurses of the Glasgow Fever Hospital for the last six or seven years have had typhus characterized by the eruption, and not one of them, as far as we have been able to learn, have ever had it since; while almost all of them consider themselves now perfectly secure against a second attack, although constantly exposed to the effluvia arising from fever patients."*

Dr. PERRY, of Glasgow, in a letter to the editors of the *Dublin Journal of Medical Science*, says—"I have, for some years, entertained the opinion, founded upon an extensive series of observations, that contagious typhus is an *exanthematous disease*, and is subject to all the laws of the other exanthemata; that, as a general rule, it is only taken once in a lifetime, and that a second attack of typhus does not occur more frequently than a second attack of small-pox; and, judging from my own experience, less frequently than a second attack of measles, or scarlet fever." Dr. STOKER speaks of the poor as having frequent attacks of fever in the course even of a short life, and thinks that few adults have escaped these attacks, although he has no doubt that the succeeding attacks are milder than the first. Dr. O'BRIEN, in one of his hospital reports, says—"Some of the nurses have had the disease three or four times." Dr. BARKER is of opinion, that if the measly eruption is full, second seizures are very rare, and that the liability to these is less in proportion to the duration and severity of the first attack. Dr. ALISON thinks, whilst the susceptibility is much diminished by a first attack, entire immunity is not conferred.]

6. Fever is usually communicated by long exposure to the emanations from the sick, and seldom by any single short exposure, however decided. This general law seems to follow as a corollary from what was stated in the third section. It is a common notion that single, brief, decided exposures often occasion an attack; and, in support of this notion, reference is made to cases where individuals can trace the infection, as they imagine, to a particular fever patient, by having experienced some very peculiar morbid sensation at the time of exposure. There is much room for fallacy, however, in observations of this kind; and, besides, their proportion is small, compared with the far more numerous instances where no such sensations can be recalled as having ever been experienced. That communication in this way must be extremely rare, is evident from unequivocal facts; for, if short decided exposures could readily produce fever, how happens it that the disease is so very seldom propagated among the attendants of medical students and others of the better ranks who labour under it? That the infection is communicated rather by frequent and long imbibition of the poison, will farther appear from the

* [DAVIDSON, Thackery Prize Essay, loc. cit.]

manner in which a previous attack confers partial protection subsequently. The common interval in the case of clinical clerks and nurses, between taking charge of fever patients for the first time and the breaking out of the disease, is three or four weeks. In the instance of a second attack the interval is about as many months, as if simply a longer draught and larger quantity of the poison had become necessary for the development of its influence. It seems probable, indeed, that a second attack of true infectious fever scarcely ever takes place, except under repeated and long-continued exposure.

[Many interesting cases are mentioned by respectable authorities, however, where the disease manifested itself immediately after direct communication with infected persons. Sir Henry Marsh relates a great number of cases of this description,* and says that they are a few among many facts of the same kind, which he has been able to collect, and that every day's observation adds to their number. Most of these are cases of physicians or attendants on the sick, who, in the course of their duties, have been exposed to some strong offensive odour arising from the bodies or clothes of patients, and were immediately seized with the initial symptoms of the disease, which soon became fully developed. Drs. Crawford, James Clarke, and Waring died under such circumstances. Dr. Gerhard relates two cases of the same kind, before alluded to (p. 104). The nurse was shaving a man, who died in a few hours after his entrance; he inhaled his breath, which had a nauseous taste, and in an hour afterwards was taken with nausea, cephalalgia, and ringing in the ears. From that moment the attack of fever began, and assumed a severe character. The assistant was supporting another patient, who died soon afterwards; he felt the pungent sweat upon his skin, and was taken immediately with the symptoms of typhus. Dr. Copland mentions the case of a young lady, who went to visit an intimate friend, ill of fever, and having gone into the chanber was sensible of a disagreeable odour, on the curtains of the bed being withdrawn. She was soon afterwards attacked with the fever.]

7. It is not improbable that, on an average, the severity of the disease bears some proportion to the amount of exposure. This point cannot easily be settled with any precision. But the affirmative is rendered a reasonable presumption by the fact, that hospital nurses, clinical clerks, and others similarly exposed, undergo, with very few exceptions, a much more violent attack than the average.

8. Individuals affected with other febrile and inflammatory diseases are not subject to invasion from exposure to fever so long as their primary disease continues; but this protection ceases

* [Dublin Hospital Reports, vol. iv.]

on convalescence being established, and probably even gives place to greater susceptibility. Hence patients with eruptive fevers may be safely kept in fever wards until the symptomatic fever subsides; but, when convalescent, they run very great risk of taking fever, if not speedily removed from such exposure.

9. The infection of fever takes effect, on an average, more readily among those who are constitutionally infirm than among the robust. It is a great mistake to suppose, as some do, that robust and sound constitutions are little subject to be invaded by fever, if exposed to its cause. Numberless instances to the contrary may be observed in every epidemic. But that the disease attacks with greater facility those of infirm constitutions is sufficiently apparent from the interesting and well-ascertained fact, that, during extensive epidemic visitations, it often seems, as it were, to swallow up other diseases. The general patients of hospitals in large towns become generally fewer in number, simply because those, who, in other circumstances, would have suffered from disease at large, escape that fate by swelling the list of the epidemic devastations.

[The opinion is a prevalent one among medical men, that weak and delicate persons are more liable to fever than the strong and robust. It is not capable of proof, however; and is founded on the general assertion of authors. Dr. Davidson kept a record of the physical habit of the patients admitted into the Glasgow Fever Hospital from May 1st to November 1st, 1839, and the following were the divisions adopted:

1. Moderate, by which is meant a person having an ordinary quantity of muscle and cellular substance.
2. Full or plethoric, having an extra quantity of adipose texture or of blood.
3. Muscular.
4. Spare.
5. Emaciated or unhealthy in appearance.

	Males.	Females.	Total.
Moderate - - - - -	116	93	209
Full or plethoric - - - -	28	73	101
Muscular - - - - -	44	...	44
Spare - - - - - -	24	41	65
Unhealthy or emaciated - - -	2	8	10
			429

The whole of these 429 cases were characterized by the typhoid eruption, and will, therefore, be considered as decided cases of typhus. It appears from this table, that there were only 10 cases in an emaciated or unhealthy condition; and almost all of them, as far as could be ascertained, were engaged in their ordinary occupations at the time of their seizure. The spare and unhealthy,

when added together, only form about 17 per cent. of the whole number.]

10. The infection of fever diminishes in effect as life advances. This general fact is universally admitted. It may be beautifully illustrated from the data supplied by Dr. Cowan for the epidemic of Glasgow in 1836. The following table combines the relative population in 1831, and relative fevers admitted into hospitals in 1836, at different ages:—

Age	5 to 10	10 to 15	15 to 20	20 to 30	30 to 40	40 to 50	50 to 60	above 60
Population	25,707	21,211	20,745	38,185	26,419	18,014	11,648	10,220
Fevers	191	318	501	715	309	128	43	11

No correct inference can be drawn from this table in respect of children under fifteen, because the same proportion of the sick poor under that age, do not apply for admission into hospitals as at other ages. But, from Dr. Cowan's data above that age, it may be calculated that, if the chance of seizure between fifteen and twenty be supposed to be 100, it becomes between twenty and thirty, in round numbers, 78; between thirty and forty, 49; between forty and fifty, 29; between fifty and sixty, 15; and above sixty, 4½.

[During the epidemic at Philadelphia, in 1836, children were rarely attacked. After childhood, age seemed to exercise little or no influence upon the susceptibility of the disease. Amongst the whites, when the age could be more accurately relied on, there were as many patients under thirty-five as over that age. Dr. Geary, in his report of the Limerick Fever Hospital, states "that children are much more liable to fever than is generally supposed, and to the little apprehensiveness of disease being transmitted by them, may be attributed the spread of disease through families in many instances. It will be seen underneath that nearly one-sixth of the admissions for 1836 were under ten years of age, a fact which bears out what we have stated, and is also a satisfactory proof of the increasing confidence which public hospitals are acquiring from the community. . . . . Of the entire treated for the year, full two-thirds were under twenty years of age."* A discrepancy will be immediately observed between the conclusions of Dr. Cowan and Dr. Geary. It must be shown that the admissions of cases into hospitals are in the same proportion as to ages as that which existed amongst the population from which they were sent. Dr. Arthur Thompson compiled the following table to remedy this defect:

* [Dublin Journ. Med. Sci., vol. xii., pp. 98, 99.]

Table showing the estimated number in the inhabitants at Glasgow at each age during the year 1836; *the number attacked by fever, together with the ratio attacked out of every thousand at each decennial period of life.*

Ages.	No. of inhabitants at each age.	No. attacked by fever.	Ratio per 1000 attacked by fever.
Under 10	67·469	3811	56
10 to 20	50·009	1539	30
20 to 30	46·275	1611	34
30 to 40	32·044	911	28
40 to 50	21·758	392	17
50 to 60	14·090	294	20

It appears from this table that the greatest susceptibility to fever occurred under ten years of age, after which fever occurs most frequently among persons between the age of twenty and thirty. The number attacked after the age of thirty decreases gradually as life advances.* Into the Glasgow Fever Hospital there were admitted, during the year 1836, 2257 cases of fever; and out of this number there were 41 under five years of age, and 3 between seventy and seventy-five years.† Into the Limerick Fever Hospital, during the year 1836, there were admitted 3227 cases of fever, and there were 81 below five years of age, and 10 between sixty-five and seventy years.‡ Dr. Craigie treated in the Edinburgh Royal Infirmary 7 cases of fever between sixty and seventy years, among 343 admissions.§ Dr. Davidson states that he has met with, in the Glasgow Fever Hospital, 5 cases of eruptive typhus in children reported to be three years of age, from the 1st May to 1st November, 1839. Dr. Barker, in the course of the epidemic of 1817, '18 and '19 in Ireland, witnessed the disease in many children under the age of four or five.]

11. The sexes seem equally exposed to receive infection. In the Glasgow epidemic of 1836, among 2260 cases 50·5 per cent. were females, and 49·5 males. In the Edinburgh epidemic of 1819, of nearly 1600 patients 57 per cent. were females, and 43 per cent. males. The slightly superior liability of the female sex is probably owing to their greater exposure as attendants of the sick.

[The facts hitherto published regarding the susceptibility of the sexes to fever, are not sufficiently extensive to warrant any positive deductions. So far there is no positive evidence that one sex is more liable to the disease than another. "The number of

* [Edinburgh Med. and Surg. Journ., July, 1838, p. 92.]
† [Cowan's Vital Statistics of Glasgow, p. 20.]
‡ [Dublin Journ. of Med. Sci., vol. xii., p. 99.]
§ [Edinburgh Med. and Surg. Journ., vol. xlvi., p. 35, and vol. xlvii., p. 329.]

admissions into the Glasgow Fever Hospital during the year 1836, were 1116 males and 1141 females,* which is only a small excess of females; but if the excess of the female over the male population of Glasgow be taken into the account as about one-sixth, the proportion of males that have been affected with fever will be plus instead of minus. In the same institution were admitted, from May 1st to November 1st, 1839, 270 males and 276 females, classified under typhus. Into the Cork Street Fever Hospital, Dublin, from 5th January, 1817, to 30th April, 1818, there were admitted 2883 males and 2849 females, which is a small excess of males.† Again, in other hospitals, there has occurred an excess of females. There were admitted into the Waterford Hospital 1277 males and 1452 females,‡ into the London Fever Hospital, 1229 males and 1308 females,§ into the Limerick Fever Hospital, 1332 males and 1895 females, being a large excess of females,‖ and into the Edinburgh Royal Infirmary 962 males and 1075 females.¶ From Dr. Mateer's statistics** it appears, that of 9588 patients admitted into the Belfast Fever Hospital, between May, 1813, and May 1835, inclusive, 5130 were females, and 4458 were males. Drs. Barker and Cheyne remark, that, "in Dublin, when the epidemic had completely established itself, the males admitted to hospital were most numerous, but in its progress the admissions of females exceeded those of males. . . . As to the comparative frequency of fever in the male and female sex in the country at large, we can form no decisive opinion, the answers to our inquiries on that head not having been perfectly satisfactory."†† The general excess of the female population in large cities will account for this excess.]

12. The poison of fever is very apt to take effect under the casual co-operation of cold, fatigue, excesses, and other occasional causes of the febrile inflammations. In many instances fever breaks forth apparently from gradual charging of the constitution under constant exposure to the morbid emanations, and without any other co-operating cause. But in many cases, too, the poison seems to lurk in the constitution for a great length of time, unable to call forth febrile action; till at length some decided exposure to cold, or some great and fatiguing exertion, especially in the way of night-watching, or above all, some unlucky excess of the table —any cause, in short, which occasions either unusual exhaustion or some decided excitement—suddenly lays the system open to

* [Cowan's Vital Statistics, p. 19.]
† [Barker and Cheyne on Fever, vol. i., p. 91.]
‡ [Ibid., p. 193.]
§ [Dr. S. Smith's Treatise on Fever, p. 432.]
‖ [Dr. Geary's Report, Dublin Journ. of Med. Science, vol. xii., p. 10.]
¶ [Edinburgh Med. and Surg. Journal, Oct., 1839, p. 448.]
** [Dublin Journ. of Med. Scien., vol. x.]
†† [Barker and Cheyne on Fever, pp. 89–90.]

the invasion of the hidden adversary, and fever at once breaks forth. Those, therefore, who are much in contact with fever patients, can scarcely be too careful in avoiding all sources of great depression and exhaustion of the bodily powers.

13. The ravages of fever are invariably promoted by all circumstances of national or public poverty and distress. Seasons of scarcity, or of sudden diminution of employment for the working-classes, are the sure harbingers of an epidemic visitation of continued fever; and, when these occur during the prevalence of an epidemic, its ravages are always very much extended. A singular illustration of the latter incident occurred in Glasgow, during the late protracted "strike" among the manufacturing population for a rise of wages. In 1837 it was ascertained by the authorities, that, in consequence of the insane proceedings of the workmen, 8000 females alone were thrown out of employment, and became utterly destitute for many months. This happened during the prevalence of an epidemic, already unexampled in that city for extent. Nevertheless, in 1837 its previous ravages were actually doubled; and about 22,000 of the population were attacked, of whom a tenth part perished.

[The connection of epidemic fever with misery and destitution is striking. Where we find the poor the least exposed to suffering and want, we find them the least subject to fever. "Next to contagion," says Dr. GRATTAN, in his account of the fever of Ireland in 1818, (p. 11), "I consider a *distressed state* of the general population of any particular district, the most common and most extensive source of typhoid fever; whether this has been the result of war, or been produced by the more gradual progress of domestic misfortune. . . . The present epidemic is principally to be referred to the miserable condition of the poorer classes in this kingdom." "That it is always in persons suffering," says Dr. ALISON, after referring to the sufferings of the Irish in 1818, "or who have lately suffered, similar privations and sufferings, and the mental depression and despondency which naturally attend them, that continued fever becomes extensively prevalent, is fully established by the history of all considerable epidemics. The elaborate work of Drs. CHEYNE and BARKER, shows that this has been strictly true of all the great epidemics which have appeared in Ireland since 1700, each of them lasting fully two years, viz., in 1708, 1720, and 1731, in 1740–41, (after the great frost of 1740,) in 1800–01, after the rebellion, the transference of the seat of government to London, and the scarcity of 1799 and 1800; and again, in 1817, after the transition from the state of war to that of peace, and the scarcity of 1816 and 1817. That work contains reports from the most eminent physicians in all parts of Ireland on that great epidemic, all agreeing in the statement, that the

poor were the greatest sufferers, and the fever seemed to rage among them in a degree proportionate to the privations they had endured. In Ireland, accordingly, at least during the present century, as the general condition of the poor has been decidedly worse than either in England or Scotland, so contagious fever has never ceased to be more generally prevalent. The same observation applies to the epidemic fever in London after the scarcity of 1800, (the last great epidemic which has occurred there)—to the great continental fever of 1813–14, which followed the track of the French army retreating from Russia, but never made much progress in the victorious allied army—to the epidemic fever of 1817, in Italy, consequent on the scarce year 1816—to the epidemic which affected the British army in Holland, after the disastrous retreat from Flanders in 1794—in Portugal after that from Burgos in 1812—and to that which nearly decimated the British legion at Vittoria in 1836."—(*Management of the Poor*, &c., p. 12.) "That the same cause," continues Dr. ALISON, "has acted very powerfully in producing the recent epidemics in Scotland, appears distinctly from the following considerations. First, it appears from observing the times of these epidemics, the first in Edinburgh beginning in 1817, after two bad harvests, and at the same time as the Irish one; the next in 1826, after the great failures in 1825, and the sudden cessation, particularly of building speculations, in Edinburgh; and the last in 1836, after the great depression of trade both in Glasgow and Dundee, with which towns the lower orders here are much connected, and under the combination of other circumstances already mentioned, which have depressed the condition of the poor in Edinburgh of late years." Dr. ADAMS states, that "during the winter of scarcity in 1799 and 1800, fever from infectious atmosphere was so general as to excite us to imitate the example of those manufacturing towns which are never free from the disease, and a fever-house was established in London."* Dr. BATEMAN remarks, that "deficiency of nutriment is the principal source of epidemic fever, and that the circumstances just alluded to, (improvement in all the arts of life,) operate only as accessories in fostering and multiplying it will scarcely admit of dispute. . . . . The last epidemic which occurred in London, followed a scarcity of two successive years (1799 and 1800); and it was during the prevalence of this fever that the necessity for establishing a House of Recovery became manifest. . . . . Whether the epidemic of 1817 has been really much more extensive than the former, I am unable to determine. It might have been expected, indeed, that the present epidemic would exceed the last in the extent of its course, since it occurred at a period of unparalleled distress among the labouring poor;

* [ADAMS' Inquiry into the Laws of Epidemics, p. 30.]

when the loss of employment, occasioned by the termination of the war and the general suspension of the manufactures, concurred with the failing harvest of 1816 to increase the difficulties of procuring subsistence."* Dr. TWEEDIE observes that "it is an undeniable fact, founded on the experience of many epidemics, that there are certain circumstances which render the system peculiarly predisposed to the action of febrific causes; and the connection of scarcity and privation with the occurrence of fever among the lower classes of the community, has been so often verified by the experience of epidemics, as now to be received as a general axiom."† Dr. COWAN attributes the increase of fevers in Glasgow to the same causes. "From the close of 1836, one of those periodical depressions in trade, arising from the state of our monetary system, has visited this city, and deprived a large proportion of the population of the means of subsistence. From the existence of secret combinations among the working classes in various departments of trade, but especially among the cotton-spinners, and the 'strikes' which resulted from these combinations, a very large proportion of the inhabitants, in addition to those already suffering from the state of the money market, were suddenly deprived of employment, and consequently of the means of procuring food. The high price of coal was the means of diminishing the hours of labour, and consequently the amount of wages in numerous factories, and placed fuel beyond the reach of the lower classes for domestic purposes. And in addition to these sources of misery, the average prices of grain were much higher during 1837 than they had been for some years previously."‡]

14. Fever is probably apt to extend its devastations with peculiar impetuosity in localities which are damp, or exposed to noisome effluvia, arising from organic matter in a state of decay. This proposition is generally admitted by authors on fever; but more satisfactory evidence seems desirable, before it can be allowed to rank unquestioned among the laws of infection.

[Nothing very positive concerning the influence of weather on the propagation of fever, has as yet been ascertained. Whilst some writers deny its effects altogether, others who acknowledge them, disagree as to their nature. The following table, constructed by Dr. DAVIDSON, shows the comparative number of admissions in each month, the mean temperature, and average quantity of rain.

* [BATEMAN on Contagious Fever, pp. 4–11.]
† [TWEEDIE's Clinical Illustrations of Fever, p. 78.]
‡ [COWAN's Vital Statistics of Glasgow, p. 33.]

Months.	No. of Cases admitted.	Mean Temperature.	Average quantity of rain in inches.
January . .	2895	36°	1·90
February . .	2825	38	1·49
March . . .	3152	43 9	1·39
April . . .	3374	49 9	1·84
May . . .	3990	54	2·00
June . . .	4365	58 7	1·94
July . . .	4999	61	2·55
August . . .	5261	61	2·15
September .	5046	57	2·29
October . .	5624	48	2·41
November .	5054	42	2·79
December .	5359	39	2·58
	51·944		

"This table shows that the greatest number of fever cases were admitted into the various hospitals from July to December, or during the last six months of the year; and that during this period the average quantity of rain which falls is much greater than during the first six months of the year. If we compare any one month of the last six with any one month of the first, there will be found a similar difference. The same table also shows that the temperature may vary considerably during a similar prevalence of fever, and that nearly the same temperature may prevail with a great variation in the number of cases. Thus, in August the number of cases is 5261, and in December the number of cases is 5359, being a difference only of 98; but the mean temperature of the first-mentioned month is 61°; while that of December is only 39°; the quantity of rain, however, in both of these months is above the average. In March the mean temperature is 43° 9, and the number of cases 3152; while in November the mean temperature is 42°, and the number of cases 5054; but the quantity of rain in March is 1° 39, while in November it is 2° 79, being double the amount of that which falls in the first-mentioned month. In February the mean temperature is 38°, and the number of cases 2825; while in December the mean temperature is 39°, and the number of cases 5359; but the quantity of rain in the first of these months is 1·49 inches, while in December it is 2·58 inches.

"The conclusions which may be drawn from this table, are, that in all the months in which the quantity of rain is above the average, fever prevails to a greater extent than in those months in which it is below this point. It does not appear, however, from it that the average range of temperature of this climate has much

influence on the prevalence of fever; for if moisture be present, it may prevail to about the same extent, when the average temperature is 61°, as in August, or when it is 39°, as in December. The diffusion of fever is thus generally connected with humidity of the atmosphere."*]

It has often been observed, that fever rages to an unusual extent, and with peculiar virulence, where the atmosphere is constantly loaded with putrid effluvia; and some experiments on animals would even seem to show, that an affection like fever may be absolutely produced by this cause alone. But many facts of a contrary nature are constantly occurring in the history of epidemics, which clearly prove that the law is by no means universal or even general; and that it probably applies only in the instance of peculiar kinds of effluvia, which, however, have not yet been ascertained.

[Dr. Davidson has so ably condensed all that relates to the alleged sources of continued fever from putrid effluvia, that we shall transfer his remarks to our pages. "It is a well-established fact," he remarks, "that the accidental inoculation of the body with decayed or putrid animal matter has produced morbid symptoms, resembling in some respects those of typhus fever, and many medical men have been so affected, after making necroscopic inspections. There is always, however, in such cases, extensive local disease of the member inoculated, or a diffused cellular inflammation. According to the researches and experiments of MM. Gaspard, Majendie and Leuret, and Hamont, putrid animal matter, when injected into the veins of healthy animals, proves speedily fatal,† and putrid vegetable matter acts similarly, though to a less degree; while the symptoms induced have some resemblance to those in typhus fever.

The following were the symptoms which were produced in a dog, into the jugular vein of which M. Gaspard injected a putrid solution of fermented cabbage, on the 14th July, 1821. Some hours after the injection of the liquid, there were great malaise, difficult respiration, vomiting, and great weakness. At the end of nine hours a very copious black and liquid stool. On the 15th, the weakness was more considerable; there were lateral decubitus, small and feeble pulse, ardent thirst, natural and abundant urine, free respiration, strong pulsations of the heart, as in aneurism with hypertrophy of that organ. On the 16th, some improvement, less weakness, no pulsations of the heart, great thirst, disinclination to food, fever, and occasionally vomiting of drinks. 17th, the same symptoms. 18th, symptoms aggravated, extreme feebleness, staggering locomotion, excessive thirst, red inflamed eyes and filled with mucus, tumefied nostrils obstructed with

* [Davidson, loc. cit., p. 55.]
† [Christison on Poisons, p. 583.]

mucus, mucous membrane of mouth red and phlogosed, a liquid grayish-white stool with some clots of putrid blood, and death at the end of the fifth day of the experiment. On dissection, the lungs were found black and slightly inflamed, but still sufficiently crepitant. The right ventricle of the heart contained an albumino-fibrous concretion, which extended into the superior cava and pulmonary artery. The mucous membrane of the intestines, especially that of the duodenum and rectum, and a portion of the small intestines, was violet-red, as if ecchymosed, inflamed chiefly in the form of longitudinal wrinkles and by irregular plaits, which variegated the exterior of the intestines before their incision. The mucous glands of the rectum were swollen and very distinct. The mesenteric glands appeared to be engorged with blood and were completely inflamed; the gall-bladder was filled with black, thick, and ropy bile.*

In several particulars the symptoms of a malignant case of typhus were exemplified in this experiment upon the dog; the small, quick pulse, the peculiar decubitus indicating great weakness, the black stools, the red colour of the mucous membrane of the mouth and fauces, the injected eyes, and finally the staggering as indicative of delirium. The necroscopic inspection also furnishes some points of resemblance, namely, the inflammatory patches in the mucous membrane of the intestines, the enlarged glands in the rectum, the swollen and engorged mesenteric glands, the black, ropy bile; all of which are pathological appearances more or less frequently met with in typhus. M. Majendie found that fatal effects were produced by confining dogs over vessels in which animal matters were undergoing the process of putrefaction; but pigeons, rabbits, and Indian hogs, were not in the least injured by a residence in the same cage for nearly a month. He repeated many times this experiment with dogs, and always obtained the same result with one exception; but he states that in this case the dog was acclimated, for the injection of a putrid liquid into his veins had little effect upon him. The symptoms, however, are different from those produced by the injection of a putrid fluid into the veins; for the animals seem to die only from extenuation at the end of about ten days; and the post-mortem appearances are a total absence of fat, of aliments in the stomach, and of chyle in the lacteals; while the mucous membrane of the intestines is inflamed, but less so than when putrid matter is injected into the veins.† It appears, however, well authenticated, that workmen employed in peculiar manufactories, and who are constantly exposed to the effluvia arising from animal substances in a state of putrefaction, are not subject to any of those morbid

* [Journal de Physiologie, tom. ii., p. 16.]
† [Ibid., tom. iii., p. 85.]

effects which result from the injection of putrid matter into the veins, or, according to M. MAJENDIE, to those which result from exposure to putrid effluvia; there must, therefore, be some other explanation given of the last-mentioned author's experiments, or some unknown concurring circumstances must be required to bring the poison into operation. One of the most remarkable and repulsive manufactories, or rather nuisances, of this kind is the Chantiers d'Ecarrissage de la Ville de Paris. It is an inclosure of many acres of ground, situated close to the walls of Paris, and has existed for several centuries. Into this receptacle are carried the contents of the necessaries of the city; and the carcasses of 40,000 or 50,000 horses, dogs and cats are flayed and cut up there annually. Various parts of these animals are separated and manufactured for sale: the intestines into gut for machinery; the fat is melted for blowpipe lamps; the flesh, blood, &c., are collected for manure; a compost is made to breed maggots for feeding poultry, and the bones are chiefly used as fuel. Hordes of rats live in this bed of filth, and extend their ravages extensively in the neighbourhood. The fetor which arises from it is overpowering, and often spreads to a great distance. It is remarkable, however, and contrary to every preconceived notion that could be formed respecting its salubrity, that the workmen of this establishment and their families are healthy, the most of them being stout and long-lived. This fact has been established satisfactorily by PARENT-DUCHATELET. This author states that they have all the characteristics of the most blooming health; that in this respect they resemble butchers, and that they seem to attain longevity more frequently than other artisans. Even new workmen employed upon extra occasions, although not acclimated, do not appear to be more susceptible, nor do they become affected with any disease. During the time that cholera prevailed in France, not an écarrisseur was affected with the disease, and not one was sick; and the mortality of the village, which is in the vicinity of Montfaucon, was very small when compared with that of Paris. He also quotes the innocuous influence of the human bodies which are exhumed to the extent of 200 annually from Père la Chaise, and the exhumations from the cemetery des Innocents, amounting to about 20,000 bodies annually, which occupied three years in the execution, and which were also carried on during the greatest heats of summer.* Dissecting rooms are also situations where putrid effluvia are constantly present; and it has been affirmed that those who are much confined to these places do not enjoy good health and are subject to fevers. MM. D'ARCET and PARENT-DUCHATELET state that the most frequent indisposition among those who are engaged in dissections is dyspepsia and

* [Annales d'Hygiène Publique, tom. viii., p. 139.]

diarrhœa, but that this latter affection is frequent among the strangers who arrive at Paris. These authors cite an immense number of authorities of the highest respectability, namely Boyer, Dupuytren, Lallemand, Roux, Jadelot, Breschet, &c., to prove that dissecting rooms are not insalubrious, and are not productive of fevers. M. Andral states that gastro-enterite, meningitis and typhoid fever are common among the young élèves of medicine during the first year of their residence at Paris; but so little does this depend upon their sojourn in the dissecting amphitheatre, that among those who are affected, there are at least as many seized before they commence their dissections as after this period. He adds that the health of the men employed in handling the débris of dead bodies is similar to that of other individuals.* The workmen employed in the manufacture of strings for musical instruments are exposed constantly to the putrid effluvia of animal substances, arising from their long maceration, and they are not more subject to fevers than other tradesmen.

Butchers, who are believed by some authors to be almost exempt from fevers, are exposed in the slaughter-house to the emanations arising from the putrid blood and other animal fluids, which are frequently allowed to stagnate, and which are sufficiently indicated by the fetid and insupportable odour which issues from these places during hot weather. The atmosphere of whale vessels must be constantly impregnated or rather saturated with the effluvium that issues from large and numerous fishes; yet fevers are not prevalent among the seamen. Majendie states that the most deleterious animal poison is the putrid water of fishes: when some drops of this water are injected into the veins, in less than half an hour symptoms very similar to those existing in typhus and yellow fever are produced, and the animal dies in about twenty-four hours.† It appears from these facts that persons may live constantly amidst the most concentrated putrid animal emanations and yet not contract fever of any type; may enjoy health of the most perfect kind; attain longevity in many instances, and be less subject to some epidemic diseases than the inhabitants in their neighbourhood. It may be asked how are the experiments of M. Majendie and others to be explained upon this view? It does not appear from M. Majendie's experiments that the same symptoms or pathological appearances were produced by exposing dogs to putrid animal emanations, as by injection of a putrid fluid into the veins; indeed, he admits this himself; but adheres to the belief that the effluvium was the cause of death in the dogs subjected to experiment, although no injurious effects were produced on several other animals. Many ani-

* [Annales d'Hygiène Publique, tom. v., p. 301.]
† [Journal de Physiologie, tom. iii., p. 83.]

mal poisons, however, operate differently on different organs and tissues; and this is well exemplified in an experiment mentioned by Dr. Christison, namely, that "a pupil of Professor Mangili swallowed at once the whole poison of four vipers without suffering inconvenience;"* but if a small quantity of this be inserted into a wound, poisonous effects are always produced. From a consideration of the whole evidence that might be adduced respecting this point, it may be drawn as a conclusion that although putrid matters, when injected into the veins of animals, cause death under symptoms similar to those of typhus fever, yet that the effluvia arising from similar matters do not under ordinary circumstances produce any deleterious effects on man. That there are exceptions to this general law we doubt not, such as Olivier being affected with diarrhœa after visiting a cellar filled with old bones, and Chevallier being seized with the same disease after exposure to the emanations from dead bodies; but that the effluvia arising from animal substances in a state of putrefaction constitute any regular source of continued fevers, we think there are no grounds for believing.]

15. While a distinct account may thus be given of a variety of circumstances which regulate the prevalence of fever as an epidemic, occasions also nevertheless occur, when the co-operating circumstances are incomprehensible. All the appreciable causes which are believed to promote its extension may be wanting, and still there is an epidemic which extends instead of diminishing. Hence physicians have been reduced to the necessity of inferring the existence of hidden atmospheric influences—of some property of the air different from any of its known physical properties, or perhaps compounded of certain states of those properties—by which the propagation of fever is favoured. This co-operating cause is universally allowed to exist. Yet, after all, the expression denoting that cause is really nothing else than a theoretical way of declaring the fact that something exists, with the nature of which we are unacquainted. It is a mere cloak of convenience for covering ignorance.

16. Much has been written respecting the propagation of fever and other infectious diseases by means of *Fomites*, or substances by which infectious effluvia are absorbed, retained for a length of time, and afterwards given off, with the effect of communicating the disease which produced them. All the investigations, however, yet made on this subject are vague. In regard to fever, it seems probable that fomites do not contribute much to its propagation, and that infection is not retained by them long.

[Whilst the English army was in Germany in 1743, typhus fever prevailed to a great extent among the troops. A number

* [Christison on Poisons, 3d ed., p. 577.]

of tents were given to a workman at Ghent to repair; he and twenty-three of his associates were seized with the fever, and of these twenty-four, seventeen died. Sir JOHN PRINGLE, who relates the circumstance, adds, that there had been no direct communication between any of the sick soldiers and these persons. Many other similar instances are recorded by high authorities.]

17. [*Recency of residence* appears to predispose greatly to attacks of typhus. To illustrate this Dr. DAVIDSON has constructed and published the following table. It comprehends 568 eruptive cases, which were admitted into the Glasgow Fever Hospital from November 1st, 1838, to November 1st, 1839. It shows the number of patients born in Glasgow, the number of strangers, and the duration of their residence in Glasgow.

	Males.	Females.	Total.
Natives of Glasgow . . .	77	99	176
Strangers resident from 1 to 14 days	12	4	16
2 weeks to 1 month . . .	7	6	13
1 to 2 months	10	14	24
2 to 3 months	10	8	18
3 to 4 months	5	5	10
4 to 5 months	5	3	8
5 to 6 months	9	12	21
6 months to 1 year . . .	29	26	55
1 to 2 years	24	17	41
2 to 3 years	13	10	23
3 to 4 years	6	11	17
4 to 5 years	12	4	16
5 to 10 years	29	32	61
10 to 20 years and upwards .	36	33	69
	284	284	568

"It appears from this table that among 568 eruptive cases of typhus, in whom this point was ascertained, 176 were natives of Glasgow, and 392 were strangers: 206 of these strangers had resided in Glasgow only from one day to two years, and 186 from two to twenty years and upwards. The strangers amount to about 69 per cent. of the whole number of cases; and those who were affected within two years of their residence in Glasgow to about 52 per cent. of the whole number of strangers.

"The following deductions may be drawn from these facts: 1. That strangers are more liable to become affected with typhus fever than native residents. 2. That the majority of strangers are infected within a comparatively short period of their residence in Glasgow. 3. That a minor proportion of the strangers, like the natives of Glasgow, may escape infection for many years, and

yet be afterwards attacked. These results support the views which we have elsewhere given of the laws of typhus.

"Most of the strangers come from country districts in which it may be fairly presumed that typhus does not constantly exist, as it does in large towns; it is therefore probable that the majority of them are unprotected by any previous attack; for if typhus attack an individual many times during his life, why should the natives of a town containing 263,000 inhabitants, who are constantly within the sphere of contagion, bear so small a proportion to the strangers?"—(*Davidson, loc cit.*, p. 68.)]

18. [Typhus fever is a disease of cold or temperate climates. Its existence, or diffusion, at least, seems incompatible with a tropical sun; great heat destroying its contagious properties. Dr. Bancroft remarks that, "in voyages to the East Indies, ships remain for a much longer space of time between the tropics, and being also exposed to a higher temperature, the power of heat in destroying typhus is in them more decisively manifested, an entire cessation of the disease, (however prevalent,) commonly taking place before they reach the Cape of Good Hope. It has indeed never been known, as I am informed, that a single case of this fever has occurred on either side of the Indian Peninsula."*]

2. Other Causes.—Since continued fever clearly originates often in propagation from the sick to the healthy, it becomes a second question of much interest, whether it originates in any other cause. Authors and practitioners seem in general to be very easily satisfied upon this head, and to have decided the matter in the affirmative; nay, some talk with the utmost familiarity of various special causes, such as cold, fatigue, mental emotions, putrid effluvia, excesses of the table, and the like. But the question of the origin of continued fever in these causes is far from being easily settled to the satisfaction of a philosophical mind.

We know, from the experiments of Majendie, that when the lower animals are confined in a narrow space, filled with emanations from decaying animal matter, they are attacked and killed by an affection which bears considerable resemblance to the typhus of the human race. A few rare cases have been recorded of a disease apparently identical with the typhus, having broken out in the neighbourhood of places where the dead bodies of animals had been accumulated to a great extent, and buried insufficiently deep. (*Mém. de la Soc. Roy. de Méd.*, i. 97.) In the course of the last and previous centuries, it was believed to have been often observed, that a disease identical with typhus originated spontaneously in the emanations of healthy people accumulated in the loath-

* [Bancroft on Yellow Fever, p. 500.]

some abodes which were then used as prisons throughout Britain. The coast-remittent fever of Africa and other tropical countries seems to differ little in its characters from synochus with a rapid and early stage of typhoid depression. In country districts scattered instances of a fever occasionally occur, which closely resemble an indolent synochus, and which the most careful inquiries cannot refer to communication with individuals ill of a similar disease. In great towns, too, cases of the same nature are met with, during the intervals between the epidemics, and in a station of life where epidemic fever, in epidemic seasons of the worst kind is seldom witnessed. A fever of this description, tedious in its course, characterized by much nervous and muscular depression, without any particular local disturbance, and especially without the marked disorder of the functions of the brain which distinguishes most cases of epidemic typhus and synochus, was so prevalent among the better ranks in certain streets of Edinburgh some years ago, at a time when fever was not prevalent among the working-classes, that a general impression arose among professional people of the existence of some unusual local miasma. A great variety of parallel facts might be referred to, all leading to the general conclusion, that a disease, if not identical with, at all events closely resembling, synochus and typhus as described above, may arise without the possibility of tracing it to communication with the sick. A statement of this kind acquires great weight in the instance of such a visitation of disease as that just alluded to, which prevailed among people in easy circumstances in a great town. We can easily suppose a few scattered cases, occurring in a country district or in a city during an interval of immunity from epidemic fever, which may have originated in exposure to the disease, although the particular exposure cannot be traced. But it is scarcely possible to conceive such a disease prevailing to a considerable extent among the better ranks, who are so remarkably exempt from invasion in the worst epidemic periods—more especially too as there is next to a certainty that the infection of fever is seldom virulent, and that a very great majority of seizures with true infectious fever arise, not from a single exposure which might escape observation, but from repeated or long-continued exposure which could scarcely elude notice.

The only condition, then, remaining to enable us to decide in the affirmative the general question, whether fever originates in any other cause but communication with the sick, is, that the disease observed in such circumstances as that just detailed is identical with one or other of the three forms of primary continued fever of infectious origin. On this point there is room for difference of opinion. Many cases of supposed sporadic synocha, synochus, or typhus, are clearly cases of gastric or gastro-intesti-

nal fever, not recognized or admitted as such by the observer. But all cases of the kind cannot be so explained away with candour; unless indeed by holding, as some are inclined to do, that gastric fever may often occur with the local disturbance so obscure, and the constitutional disturbance so predominating, as to render the disease wholly undistinguishable from ordinary epidemic infectious fever. It is also an undoubted fact, that in cases of sporadic fever, occurring either during an epidemic visitation, or during an interval, a physician, extensively conversant with the features of true infectious fever, is commonly able to pronounce, even where the resemblance to the latter disease appears to an ordinary eye very strong, that the sporadic disorder is nevertheless not the same with the epidemic forms of the disease.

The difficulties thus introduced into the present inquiry must be admitted to be formidable. At the same time the general conclusion to be drawn from the whole facts seems to be that a disease, undistinguishable from true infectious fever, may sometimes arise without infection. Such cases, however, are far less frequent than those clearly infectious in their origin. From a statistical statement made out by Dr. Welsh in 1819, relative to the fever of Edinburgh, it appears, that among 400 cases where the patients assigned a distinct cause for their illness, there were 80 per cent. who were able to refer it to exposure to infection (p. 57.)

On descending from the general question to the more special one, what the other cause or causes of fever may be, the difficulties are greatly increased; indeed they become insurmountable, with such limited and vague facts as are at present possessed on the subject. A long catalogue of causes has been laid down in most works on the practice of medicine, or on fever. But a variety of circumstances render the inquiries regarding them fallacious. Among these, two alone seem sufficient to introduce interminable confusion and uncertainty. In the first place, few inquirers have taken sufficient pains to distinguish primary continued fever from irritative gastric fever. And secondly, the catalogue of causes alluded to is indebted for its length mainly to the non-contagionists, whose testimony may at once be rejected altogether in the matter; for if any individual is unable to see in the arguments formerly adduced sufficient evidence of infection being one cause of fever, how is it possible for him to adduce more satisfactory proofs of the operation of any other cause? How is it possible to admit that he is capable of weighing evidence dispassionately in any branch of the inquiry? or of proceeding to investigate facts with a calm and unbiased disposition?

It appears a needless waste of time and labour to attempt anything farther under this head. Fatigue, mental emotions, atmo-

spheric exposures, noxious effluvia, and excesses of the table, sometimes seem to induce an attack of fever. Often, however, the real cause is the lurking poison of infection, which the incidental source of excitement on the one hand, or of exhaustion on the other, calls forth into action. Frequently, too, the disease produced in other circumstances is an irritative, not a primary fever. And as for the few instances remaining where true primary fever appears to originate in one of the above causes, all that need be said farther is, that for one instance where such fever follows such cause, a thousand instances occur where no effect of the kind ensues; and, consequently, that some more essential influence is probably brought into play, than what appears merely on the surface of the investigation.

Whether sporadic cases of true primary fever, originating otherwise than in communication with the sick, are capable of themselves acquiring the property of self-propagation, is another question arising out of the former, which is not less difficult to answer. Unless it can be positively determined, that a particular case is truly sporadic, there is of course an end to all reasoning on the events which follow it. That such cases generally do not spread is unquestionable. But from what was said above as to the feebleness of infection in ordinary circumstances, this negative fact is no argument whatever, though non-contagionists will have it so, against the possibility of propagation taking place where the conditions are favourable. And in those cases of sporadic fever, which there is an opportunity of investigating with care, it generally happens that the conditions are quite the reverse. The general belief of the profession, and still more of unprofessional persons, is, that all primary fevers without exception, which put on the type of synochus or typhus are communicable. Although it may be difficult to show that such is the case in regard to true sporadic fevers, the doctrine is sufficiently probable. Meanwhile, this is clearly the safer doctrine to espouse on practical grounds, until the opposite shall be proved; because on the one hand it leads to the employment of ventilation and cleanliness, which are useful accessories in the treatment, and on the other hand it prevents the serious consequences which would result where infection is mistaken for sporadic fever. If we are to admit that the jail fevers of the last and preceding centuries were owing, not to infection, but to the vitiation of the atmosphere, where prisoners had been long pent up in crowds without sufficient renewal of the air, no doubt can be entertained that fevers of spontaneous origin may propagate themselves. But it is impracticable for any one in the present day to satisfy himself that the real origin of such fevers was fully ascertained; and certainly in times somewhat nearer our own, when prisons still continued to be too much the abode of

filth, foul air, and misery of every description, fever was seldom found either to get into them or out of them.

VII. PROGNOSIS.

Prognostication in continued fever is founded partly on the particular type of the disease, and the general character of the reigning epidemic, partly on particular symptoms and groups of symptoms, partly on collateral extraneous circumstances.

From the Type and Epidemic.—Of the three types of continued fever synocha is least frequently fatal, typhus most so, and synochus intermediate between the two. The general prognosis will vary accordingly. If it were possible to predict, that a case would turn out one of pure inflammatory fever, recovery might be confidently predicted, at least in the inflammatory fever of this country, and where no signs of severe local inflammation are present. Such accuracy of diagnosis and prediction, however, is very seldom possible. The more purely inflammatory the early stage of synochus is, and the longer its secondary stage is postponed, the more favourable does the prognosis become. So, too, in typhus, the nearer an approach it makes at the commencement to synochus, the less likely is it to prove fatal.

The prognostication founded upon the type in a particular case may also be qualified by the habitudes of the prevailing epidemic. Since in some epidemics synocha abounds, in others typhus, and in others the mixed type, it is plain that, from the commencement, the probability of recovery must be greatest in the first, least in the second, and intermediate in the third. But it is not in this obvious and direct way alone that the dominant character of the epidemic influences the mortality, and through it the prognosis. For, on the one hand, its remarked, that different epidemics of the same type differ in their mortality; and on the other, it seems well ascertained, that in epidemics of different dominant types, the mortality among cases of the same type differs, that is, in epidemics where synocha abounds, intercurrent cases of synochus and typhus are observed to be less frequently fatal than cases apparently the same in nature, which occur in epidemics of pure synochus and typhus. And, on the contrary, where typhus is the ruling type, typhus is more deadly, and even synochus more frequently fatal, than the same description of cases in kind and apparent severity, which are met with where the inflammatory character predominates. At all times then it is proper in forming a prognosis in a particular case, to regard first the particular type, then the frequency of that type in the epidemic, and lastly the general mortality of the epidemic; and the last two circumstances must be regulated by experience on the large scale in hospitals.

From Symptoms.—Prognostics of much importance and considerable precision may be drawn from particular symptoms, or groups of symptoms, or the manner of their commencement and progress.

Where fever commences abruptly with brisk reaction, the probability of a regular stage of reaction is greater than where it begins slowly and insidiously, and the prognosis, therefore, is in general less favourable in the latter case. If reaction, however, runs very high, and is not resolved by diaphoretic crisis, but is succeeded by a typhoid state, the prognosis is on the whole proportionally unfavourable, according to the violence of the early reaction, because the typhoid exhaustion bears some ratio to that violence. It is a more unfavourable case where the inflammatory state of the circulation gives place to the typhoid stage in the first week, than where the transition is postponed till the beginning of the second week or later; and the earlier the change occurs in the former instance, the worse is the prognosis. Except in cases of synocha, which often terminate altogether before the end of the second week, an amendment occurring in special symptoms, or in the symptoms generally, towards the middle or termination of the second week, is more favourable than where similar changes occur in the first week. In the latter circumstance the amelioration is often fallacious and temporary; in the former it commonly denotes a crisis. A material temporary amendment on the second day of synochus or typhus is not unfrequent, and often misleads the patient or his attendant. In like manner, an amendment towards evening is a more favourable sign than towards morning. In the latter case it may be merely a remission, which is not at all uncommon in every type of fever; but in the former, especially at or after the middle of the second week, the remission is very frequently the commencement of a crisis. If the case passes the eleventh day and no decidedly unfavourable symptoms take place, nor any general exacerbation, the prognosis becomes more favourable than before; and so, too, in the same circumstances on the fourteenth day. After the seventeenth, however, and still more after the twentieth days, matters are reversed, unless some amendment be observed about those days; the longer the fever lasts after seventeen days, the more unfavourable is the prognosis.

It is impossible to predict, with any confidence, the probable result of a case of fever during the early part of the first week, except in so far as a presumption may be formed as to the probable type. Special symptoms, and the degree of severity of the symptoms, are then extremely fallacious. Cases of synochus, for example, but above all, cases of typhus, may be at this time the mildest, and yet often become afterwards the worst. Frequent rigors, violent headache, irregular distribution of temperature, extreme prostration of strength, much injection of the conjunctivæ,

are among the signs which have been indicated as unfavourable, when they occur in the first three or four days particularly. But they are unfavourable, not so much in the way of special signs of danger, as because they constitute together the characters of the type of fever which may be anticipated. It is seldom till towards the close of the first, or beginning of the second week, that the prognosis from special symptoms acquires some stability.

The unfavourable signs deserving attention during the latter half of the first week are great frequency of the pulse (except in synocha), especially in persons towards or after the middle term of life, great softness of the pulse, jarring of the pulse at the extreme of its diastole with easy compressibility, and, above all, a weak, fluttering, irregular pulse; a dry, brown, and especially a retracted tongue; irregular temperature of the surface, an eruption of pale, diffuse petechiæ, or irregular sweats, with increase of fever after them; much headache, especially in typhus, and above all, when united with great flushing of the face and injection of the sclerotics; excessive prostration of strength, shown by the patient lying on his back constantly and becoming faint on sitting up; delirium of any kind, but especially either high delirium, or muttering delirium amidst a state of stupor, or pleasing delirium with quickness of expression, and a tendency to smiling or *risus sardonicus;* subsultus of the tendons and tremor of the hands; sighing respiration. Several of these symptoms are unpropitious at any time, but they are all peculiarly so if well-marked before the close of the first week; and the earlier they appear, the worse is their indication. It is supposed by some that no fever patient ever recovers, whose pulse attains 140° in frequency. This is a complete mistake. In young adults affected with synocha the pulse not unfrequently reaches this elevation, and even exceeds it, without a fatal event; and occasionally, though very rarely, in typhus the same observation is made. Recovery has taken place in the writer's experience where the pulse in typhus was 140, and in synocha at 160.

On the contrary, it may be considered a favourable case of fever, which attains the commencement of the second week without the pulse being very frequent, or increasing much in frequency about that period, without a brown tongue, or irregularity of temperature, or petechiæ, or injection of the sclerotics, or tendency to fainting, or subsultus, tremor or delirium. And additional favourable signs are a full, rather soft, and not jarring pulse, which does not materially exceed 100 in frequency; the absence of pungent heat; an eruption of small dark circumscribed petechiæ; some drowsiness, capable of being easily interrupted; some desire for food, or the ordinary compound drinks, without urgent thirst; spontaneous change of position, and occasional lying on the side; deafness, and freedom from intolerance of light. In cases of fever

assuming, in the first week, the characters of inflammatory fever, the most favourable of all special signs is the appearance of general perspiration, between the fourth and ninth days inclusive. Before the fourth day sweating is generally partial and without effect on the fever; after the ninth it is rare, and seldom beneficial; but in the interval it is commonly critical. This important criterion, however, must be qualified by the habitudes of the prevailing epidemic; in some epidemics, the appearance of general perspiration between the fourth and ninth days of an attack of inflammatory fever is the sure forerunner of its speedy and abrupt departure. In other fevers, but especially in typhus, sweating during this period, instead of being favourable, is often rather the reverse: the febrile state does not subside under it, and usually increases subsequently.

The unfavourable signs in the course of the second week of fever, are increasing frequency, feebleness, or jarring of the pulse, especially a pulse higher than 130 or near 140, which, at least in persons towards or above the middle term of life, is, with few exceptions, a fatal sign in typhus or the more typhoid forms of synochus; a highly loaded or very dry and retracted state of the tongue, with sordes on the teeth and lips; breathing hurried beyond proportion to the rapidity of the pulse, and still more when interrupted by catches, or intermingled with sighing; a marked tendency to coldness of the extremities, coupled especially with heat of the head and face; great flushing of the countenance, and much dark injection of the sclerotics, especially combined with very contracted pupils,* or with a half-shut state of the eyelids; complete prostration, with a constant supine position, and no attempt to alter it; an eruption of either large or crowded petechiæ, of the pale, diffuse, irregularly circumscribed variety; or a jaundiced colour of the skin; or the appearance of large vibices, either on the parts on which the body rests or elsewhere; or redness and excoriation of the skin where subject to pressure; subsultus of the tendons at the wrist, trembling of the hands, starting of the joints, tremor of the tongue, twitching of the muscles of the face, and, above all, convulsions, which last symptom is, perhaps, invariably fatal; excessive watchfulness, or, on the contrary, profound sopor, from which the patient cannot be roused at all, or not without difficulty; or high delirium, with

* [Dr. Graves, of Dublin, regards marked contraction of the pupil as one of the most alarming symptoms in fever with cerebral disease. "Were I called to a case," he says, "in which every other symptom was favourable, but great contraction of the pupil was present, I would say that it was a case of extreme danger. A tendency to even moderate contraction of the pupil is a very dangerous symptom in typhus; but a pupil extremely or permanently contracted, or, as it has been called, *a pin-hole pupil*, is, or used to be, a fatal sign."*a*]

a [Dublin Journ. of Med. Science, &c., July, 1838.]

vociferous talking, and tendency to get out of bed, and more especially to violence and furiosity; an anxious expression of countenance combined with much stupor; or, on the contrary, a pleased expression, with watchfulness, and a hurried, prompt manner; or hippocratic collapse; involuntary discharge of urine and feces; irregular sweats without abatement of fever.

The favourable signs during the second week are chiefly negative; that is, the absence of the preceding symptoms, or their appearance in a mitigated form. The most important are a steady state of the pulse or diminution in its frequency, with increase of fullness, and disappearance of the jerk at the extreme of its diastole; a moist state of the tongue at the edge, with the gradual departure of brownness or foulness, and with increased facility of protruding it; a moderate petechial eruption of the small, dark, circumscribed kind; a placid, drowsy expression; occasional sleep, with general drowsiness, little or mild delirium, and facility of being roused; deafness; sensibility to thirst, and some remains of appetite; a change of posture from the supine to the lateral; the supervention of swelling and inflammation of the parotid glands; the absence of excoriation from pressure. The most favourable of all signs is the departure, towards the eleventh or fourteenth day, of any of the more unpropitious prognostics mentioned above, such as a hurried pulse, dry, retracted tongue, vibices, subsultus, tremor, watchfulness, deep sopor, furious delirium, involuntary evacuations, and the like: the non-extension or diminution of erythema from pressure is also a welcome sign; likewise abatement of tympanitic fullness of the abdomen: and a sure combination of favourable prognostics is extension of moisture of the tongue, subsidence of the pulse, supervention of sleep, and return of appetite. One special sign is almost always favourable, even where many formidable symptoms are present, namely, deafness; and probably the same may be said of a soft, moderately moist condition of the tongue—an occasional, though very rare, accompaniment of the advanced stage of bad forms of typhus.

These are the leading prognostications which may be founded upon the more essential symptoms of fever. Others may be deduced from the symptoms of incidental diseases. Complications on the whole render the result more doubtful; but there are some, to which unnecessary consequence in this respect has been attached, more especially the local inflammations. Local inflammations occurring early in fever, unless they are violent, which is seldom the case, do not in general add materially to the danger, because they are for the most part easily subdued, and without the necessity of exhausting treatment. It is different, however, when they commence in the second week; for every fresh source of irritation or exhaustion is then of importance, and, besides,

some local inflammations which commence at that time are obstinate, and of themselves fraught with danger.

From Secondary Affections.—The worst accessory affections are, great congestion of the brain, if indeed this can be properly regarded as a mere accessory disorder—true pneumonia—the modification of catarrh proper to the advanced stage of bad congestive cases—inflammation of the entero-mesenteric glands, or dothinenteritis—peritonitis—icterus with bilious stools—erysipelas—gangrene and sloughing, especially if they form on several parts. Hence the special indications of the arrival of these secondary diseases, as formerly described under the head of the symptoms, will often give important warnings of danger, and seriously diminish the chance of recovery. Some qualification of this statement, however, is requisite, in regard to the symptoms of entero-mesenteric disease to sloughing. One of the best signs of entero-mesenteric inflammation in its early stage, according to all authors who have taken notice of that affection, is yellow diarrhœa, commonly associated with tympanitic distension of the belly and deep progressive stupor. But repeated experience in the epidemics of Edinburgh shows, that even all these symptoms may occur without the unfavourable proportions of deaths which ought to ensue, were they characteristic of so serious a local disease; and, in particular, that an ochry diarrhœa sometimes appears to keep down or even remove the fever, and is singly not an unfavourable prognostic. As to sloughing of parts subjected to pressure, it is rather remarkable, that, in some epidemics at least, this secondary affection is far from being so unlucky a prognostic as might be anticipated. In epidemics abounding with inflammatory cases, few die who have sloughing provided they be properly taken care of; and very seldom do they die of the sloughing. If sloughing be confined to the sacrum, and the fever subside at an early period, recovery is rarely prevented in any epidemic by this accessory evil. If the fever go on unabated, or if the local affection break out on several or many parts, the issue is commonly fatal; and almost always so during an epidemic of the typhoid type.

The favourable prognostics deducible from the secondary disorders are few in number. On the whole, the cessation of such disorders is to be welcomed. Yet the departure of the slighter varieties of local inflammation during the first week is of no great moment in itself, and has very seldom any influence on the result of the primary fever. The removal of violent attacks of local inflammation may be regarded as a propitious sign; but the reduction of the strength by the treatment which is rendered necessary should not be lost sight of, as a fresh though indirect source of danger.

From Collateral Circumstances.—There are some collateral circumstances which exert a very important influence on the prognosis in fever; among which may be chiefly mentioned age, sex, constitution, either natural or acquired, and the coincidence of cold, fatigue, privation, mental depression, and the like, about the period of invasion of the disease.

Age.—The chance of recovery from fever is greatest in childhood and youth, and diminishes rapidly with advancing age after the period of early manhood. Thus, in the Edinburgh epidemic of 1818–20, where the mortality was one in 22 for all ages, the deaths under twenty were only one in 65; while between twenty and thirty they were one in 29; between thirty and forty, one in 18; between forty and fifty, one in 11·4; between fifty and sixty, one in 6.* Thus, too, in the later Edinburgh epidemic of 1826–7, where the mortality at all ages was one in 9, that for children under fifteen was only one in 41·5; that for youth and early manhood, between the ages of fifteen and thirty, was one in 13·5; that for the middle period of life, between thirty and fifty, was one in 5½; and for people above fifty it was so high as one in 2·5.† In like manner in an epidemic in Glasgow, where the mortality during twelve months subsequent to October, 1835, was one in 8·5 for all ages, that for children under fifteen was one in 26; between fifteen and thirty, one in 9·5; between thirty and fifty, one in 4; and above fifty also one in 4.‡ An unaccountable deviation from this rule has been observed in the London Fever Hospital, whence it would appear that the fatality of fever in childhood is equal to that for all ages, or very nearly so. According to one account, that for 1828–9, when the general mortality of the Fever Hospital was one in 7·22, that for children under fifteen was so high as one in 7·33; between fifteen and thirty, one in 9·5; between thirty and fifty, one in 7·33; and above fifty, one in 2·5.§ According to another account, comprising three years subsequent to 1825, when the mortality at all ages was one in 6·82, the proportion below the age of fifteen was one in 11·33; between fifteen and thirty, one in 7; between thirty and fifty, one in 5·5; and above fifty one in 2·25.‖ The general rule, however, certainly is, that the chance of recovery is greatly superior to the general average, if the patient does not surpass the age of fifteen or even twenty; and all accounts agree in making the risk to be at least double the general average when the age exceeds forty.

* Welsh, on Blood-letting in Fever, p. 129, 131.
† Dr. Alison, Edin. Med. Surg. Journ., xxxviii., 249.
‡ Dr. Cowan, Vital Statistics of Glasgow, 1838, p. 23.
§ Dr. Tweedie, on Fever.
‖ Dr. S. Smith, on Fever.

Sex.—Sex has also an important influence. According to the tables of Dr. Cowan, for Glasgow, founded on the examination of 2259 patients, the deaths for all ages amount to one in 6·75 among the males, and only one in 11·2 among females. The probable cause of this interesting fact is the greater frequency of habits of intoxication in the male sex. At least the difference is scarcely perceptible below puberty, being among 550 patients of both sexes one in 25 for boys, and one in 28 for girls—a difference which is within the limit of statistical error, for indeed one additional death among the females would reverse the proportion. On the contrary, it becomes very marked after the age of 25, when intemperate habits begin to produce their effects among working people; for among nearly 800 of both sexes above that age the mortality among women is one in 6·33, and among men, no less than one in 3·1, or fully more than double. Conclusions precisely similar may be deduced from the tables furnished by Dr. Welsh, relative to a part of the Edinburgh epidemic of 1817–20, where the type was much more inflammatory than in the late Glasgow epidemic. In 743 patients, the deaths for all ages were one in 16 for males, one in 30 for females; under twenty years of age the deaths among males were one in 68, and among females one in 68; and above the age of twenty, the mortality among men was one in 11, among women, one in 24.

Pregnancy.—An extraneous circumstance of great consequence, and connected with sex, is the fact of a female being pregnant at the time. Most pregnant women miscarry during an attack of fever; and, when they do miscarry, a large proportion perish. It is impossible to supply numerical data upon this point; but the general rule is commonly admitted. The influence of pregnancy on the prognosis, however, seems to differ in different epidemics; and, contrary to what might be anticipated, the influence seems to be greatest, judging at least from the epidemics of Edinburgh, in those where the inflammatory type prevails, than where typhoid cases predominate.

Constitution.—It is not easy to calculate numerically the effect of *constitution* on the mortality from fever, as to ascertain that of age or sex; but its influence is acknowledged to be great —and this both in regard to original and acquired peculiarities. The healthy and robust probably suffer less than the feeble and sickly. This, however, is by no means easily decided. There can be no doubt of the evil influence of recent severe diseases. For example, convalescents from acute or severe chronic diseases, who take fever in hospitals, have always a violent attack, and a large proportion sink under it. There seems little doubt, too, that

differences in constitution depending on station in life affect the fatality of fever; for it is generally understood, that fever is more fatal in the better ranks than among the working-classes of a community. There is not any conclusive statistical evidence at present existing for this belief; but the doctrine is conformable with vague general observation, as well as with presumptions founded on the superior excitability of the brain and nervous system in the upper walks of society. It seems not unlikely, however, that an exception should be made in the instance of those epidemics of fever, where synocha abounds, and synochus is the dominant type; at least it is extraordinary, how few casualties have occurred among clinical assistants, and other medical students, during such epidemics in Edinburgh. The most powerful modifying influence among constitutional circumstances is, beyond all doubt, that which depends on habits of intemperance. In persons of intemperate habits the symptoms of nervous derangement are always unusually prominent, congestive affections are particularly frequent, especially congestion of the brain, and all the symptoms are less amenable to treatment than in the constitutions of the sober and temperate. Hence the mortality among drunkards is decidedly far greater than the average. The statistical account already given of the relative mortality among the two sexes after the age at which intemperate habits begin to be acquired, is alone a strong presumption of the truth of this fact; for it is not easy to see in what other way the difference which actually exists is to be accounted for. But besides, every hospital physician knows that the intemperate constitute a very large proportion of the fatal cases. It would be interesting, and by no means difficult to ascertain the proportion numerically; but facts for the purpose do not exist at present. Meanwhile, it is worth mentioning, that according to observation of various epidemics in Edinburgh, extremely few drunkards who have attained the age of forty survive an attack of fever. During the clinical courses of five years, prior to November, 1837, the writer had only one case of recovery under such circumstances.

The coincidence of exposure to cold, fatigue, general privations, or mental depression, with the invasion of fever, has commonly the effect of rendering the prognosis more unfavourable than it might otherwise be. Cold is apt to complicate the fever with local inflammations, fatigue to aggravate depression, and disturbing mental emotions to increase the nervous derangement and tendency to congestion of the brain. Of these coincidences the worst are mental emotions of the depressing kind.

VIII. TREATMENT.

Few diseases are now better understood than continued fever. Nevertheless the treatment which has been pursued, and to appearance with good effect, is as diversified as may well be imagined. This physician has trusted to general blood-letting, that to local evacuation of blood; one to diaphoretics and sudorifics, another to cathartics; some rely on mercury, some on opium, many on wine, a few on the cold affusion, and not a few upon nature. A cursory survey of these singular discrepancies has led sceptics and the whimsical to deny the value of any treatment beyond a confident reliance in nature's efforts, together with fresh air and the moderate use of laxatives; nor are there wanting practitioners to undervalue the usefulness even of these simple adjuncts. It is extremely difficult to settle the real amount of benefit derived from treatment in fever, by the only mode which can be satisfactory to all, namely, by comparatively statistical data. For supposing a sufficiently numerous body of facts were accessible for the purpose of comparison, the statistical method of inquiry, conclusive as it seems to be, and has been thought by many, is really surrounded with as many difficulties and sources of fallacy as any other.

But if the physician, extensively conversant with the treatment of various forms of fever, had it in his power to point out to the wavering in opinion the immediate and most palpable advantages of one method in special cases, and the immediate injury accruing from an opposite method, it is not probable that doubts would be long entertained by any unbiased understanding; and a faithful inquiry into the causes of the discrepancies in the practice of the best authorities in this department of medicine will lead to the inference, first, that there may be more than one good method of treating the same sort of fever on principles identically the same; and, secondly, that a material difference is rendered necessary in the treatment, by differences in the epidemic character of the disease.

In every other branch of inquiry into the subject of fever, it has been seen that much deference ought to be paid to its epidemic character. In no branch, however, is this precaution more indispensable than in the treatment. No one can call in question that principle, who has been much engaged in the treatment of fever for a moderate term of years. Least of all ought any one to entertain doubts on the subject, who has witnessed the different epidemics which have prevailed in some parts of Britain during the last twenty years. The general conclusion at which he must infallibly arrive is, that the particular type must regulate the treat-

ment in the particular case; and farther, that the prevalence of a particular type must in some measure modify the treatment in all types of a particular epidemic. For example, in epidemics where synocha abounds, not only are cases often met with whose type requires the use of vigorous antiphlogistics, and even of free general depletion; but likewise in intercurrent cases of synochus and typhus, antiphlogistics, and blood-letting among the rest, are better borne and more frequently required, than during epidemics of the opposite typhoid character.

In endeavouring to fix the treatment in a particular case, or for a particular epidemic, of fever, it should never be forgotten that there are two opposite conditions of the system which must be combated, excitement of the circulation and nervous depression; that these states always co-exist more or less; that their relative degree varies from the first in different cases, and prevalently in different epidemics; and that their absolute, but still more their relative degree varies much at different stages of the same case. It must further be considered, that besides primary nervous depression, the direct result of the cause of fever operating on the nervous system, there is a secondary depression also, the indirect consequence of pre-existing reaction. There is no sound foundation for the opinion of some pathologists, that no other kind of nervous exhaustion but the latter occurs in fever. But its existence and great importance in many cases cannot be denied; nor yet the influence it must have upon the method of cure. Hence it will at once be perceived, that the "indications of cure" in fever must commonly be complex and often contradictory. Violent reaction should be combated first on its own account, and secondly for the secondary exhaustion, which corresponds on the whole with its violence. But in combating reaction, care must be taken not to do so at the cost of seriously increasing direct nervous exhaustion. And on the other hand, while keeping this risk in view, it is right to shun providing too much for present depression, at the risk of augmenting subsequently that which is secondary to reaction. The due consideration of these complicated circumstances ought to leave no difficulty in understanding why so many different and opposite plans of treatment have been proposed, and apparently all with no slight success.

In a practical point of view the most useful and methodical arrangement to follow in discussing the numerous remedies employed in fever, will be to consider the treatment to be enforced at different periods of the disease, adverting at the same time to the influence of type on the several measures. Upon this principle five heads may be advantageously adopted, comprising the treatment at the commencement, in the early stage, in the middle stage, towards the conclusion or final stage, and during convalescence; to which may be added a sketch of the prophylaxis.

At the commencement the object of treatment is, if possible, to cut the disease short; in the early stage the principal objects are to mitigate reaction, and still also to cut the disease short; in the middle stage to mitigate reaction, and support exhaustion; in the final stage to support exhaustion and maintain life till the fever wear itself out; in convalescence to restore strength and prevent relapse; and at every period a collateral object often arises—the removal of secondary local disorders, and of special symptoms.

Of Incipient Fever.—It has always been a favourite object with practitioners, to discover a remedy for arresting fever at its outset. The undoubted practicability of suddenly arresting the febrile paroxysm of intermittent on its first outbreak, has probably led to the inquiry, whether as much may not be accomplished for continued fever also. Some have arrived at a favourable conclusion; and it has even occasionally been the fashion to talk with as great freedom of cutting short typhus and synochus, as one would speak of stopping an ague. The general experience of the profession, however, is unhappily opposed to such views; and especially the experience of those who are best acquainted with the true features of continued fever as presented on the great scale in hospital practice. It is very doubtful whether a true continued fever may be cut short at its outset by any means. Even apparent instances of the kind are rare; and in that case, if we consider how impossible it is in the commencement to distinguish continued fever from ephemera, as well as from some local inflammations which may be cut short, strong reason will appear for calling the authenticity of the alleged cases in question. Good evidence of the power of remedies to arrest continued fever at its first invasion is to be attained, so far as can be well seen, in one or two ways only, by the arrestment of the disease in a fair proportion of cases where it is distinctly threatened by the usual signs in persons who have been strongly exposed to infection, and where there is consequently a strong presumption that the attack, if not arrested, will really prove one of true continued fever in the form of synocha, synochus, or typhus; —or by the arrestment of the symptoms of fever in threatened relapse in those cases, which, from the general characters of the epidemic and of the particular type in each case, are of a kind where relapse in the form of true continued fever is probable. But on subjecting to this conclusive ordeal the various remedies which have been extolled for the purpose, it is apprehended, if the writer may judge from his own frequent observation, that every remedy for cutting fever short will be found almost, perhaps altogether, ineffectual. In the slighter forms of continued fever arising in other causes besides infection they may be occasionally useful; but in the far more numerous and important

class of infectious fevers, febrile action cannot be cut short at its origin.

The special remedy which has been chiefly vaunted for this purpose is an *emetic* of ipecacuanha and tartarized antimony. When administered so as to act forcibly during the stage of formation of the disease, when chills or rigor are present, and febrile reaction not yet fully established, it is held to possess the power of arresting the morbid process entirely; and this by virtue of the powerful succussion which is given to the whole system, followed by diaphoresis and sweating. There is no question that by such practice irregular distribution of temperature may be counteracted, and the stage of formation of fever shortened. But it may be greatly doubted, whether any true case of infectious fever is ever fairly cut short in that way.

Emetics, however, are often of much service at the commencement for another purpose. They remove crudities from the stomach, which are often present in consequence of the patient having indulged his appetite recently before or soon after the invasion of the disease.

Other remedies have been also proposed as useful in the incipient stage of fever for cutting it short; and, among the rest, general blood-letting. But the efficacy of the whole of them is at least as doubtful as that of emetics, so that it would be a mere waste of time to discuss their several merits. As for *blood-letting*, it has been chiefly employed with the expectation of cutting the fever short at a later period, when febrile action is fully formed.

Of the Early Stage.—By the early stage of fever is here understood that interval, commonly extending to the first week, but rarely later, during which there is more or less reaction of the circulation, and the faculties of the mind continue unimpaired. In this stage the indications of cure are, to cut the disease short, to mitigate the force of reaction, and to remove or diminish special symptoms and secondary disorders.

1. The remedies which have been chiefly trusted to for *cutting fever short* in its early stage are emetics, the cold affusion, and general blood-letting.

Emetics are not of more service for this purpose when reaction is fully formed, than at the first invasion of fever. They are now indeed very generally abandoned as inefficacious when the disease has proceeded so far; and their use is mainly restricted to the removal of crudities from the stomach.

The *cold affusion* was proposed at the commencement of the present century by Dr. Currie, as a remedy both for arresting and mitigating continued fever. It is applied by seating the patient in a tub, and pouring cold water freely from a pitcher over

the head; and repeating the process as often as the febrile heat returns. This treatment is applicable only in cases of synocha, synochus, and the few cases of typhus where reaction of the circulation during the first days is distinct. For a condition much insisted on by its discoverer, and found essential by all his imitators, is, that not only the temperature, as ascertained by the thermometer, but likewise the sensation of heat, either felt by the patient or communicated to the hand of another, shall be steadily higher than the natural standard; and it is only in fevers with a distinct early stage of reaction, that the animal heat is so circumstanced. Another condition for the success of the cold affusion in cutting short fever is, that it shall be resorted to at an early period, especially on the second, or not later than the fourth day. At a later period it may be a palliative; but it is admitted by all its admirers to have seldom the effect of arresting the disease. A third condition, and one of obvious importance, is that there shall not be present any acute local inflammation.

The success obtained from the cold affusion when practised with these precautions seems to have been for some years very remarkable; and the confidence of physicians in its efficacy was naturally not a little increased by its apparent utility in other febrile diseases, such as scarlatina. It is singular, however, how short a reputation it has enjoyed. In the first extensive British epidemic of continued fever which broke out subsequently to its announcement, it was speedily abandoned in a great measure by all practitioners; and for twenty years past it has been almost unknown in the treatment. The cause of this fluctuation in medical opinion is not very clear; but there can be no question, that the change was not made without sufficient reason. The epidemic of 1817–20—which, it has often been already remarked, ravaged more or less the whole of the British Islands—seemed, by its eminently inflammatory character, and the high pure reaction of its early stage, to be exactly the form of fever for treatment by the cold affusion. Accordingly the practice was tried by many with great perseverance. The general results were, that extremely few cases appeared to be checked by it; that, although the abatement of febrile heat and restlessness, which was indicated by Dr. Currie as its immediate effect, occurred almost invariably, this was, nevertheless, of short duration, and not to be made permanent by any frequency of repetition; that, as much good eventually was attained by frequent cold or tepid sponging, together with cold applied to the head; and that frequently it occasioned for a short time after each application an intense feeling of pressure and weighty pain in the centre of the brain, which could not be regarded without some uneasiness. Since that time the continued fever of this country has been gradually assuming more and more a typhoid type, in which the conditions for suc-

cess laid down by Dr. Currie seldom exist; and consequently the treatment has in late epidemics fallen properly into desuetude. But its failure in the earlier inflammatory epidemic of 1817–20 has always appeared unaccountable. Some have even been led in consequence to doubt the accuracy of Dr. Currie's observations. They were so generally confirmed, however, soon after they were published, that such doubts are unreasonable. It cannot be rationally denied, that the fever treated by himself and his earlier imitators was susceptible of being cut short in its course by the cold affusion. And there seems no mode of reconciling the discrepancy of the facts relative to the utility of this remedy, except by referring it to those hidden differences in the epidemic constitution of fever as well as other diseases, of which, though we cannot well indicate their precise nature, we may trace the operation in a variety of equally interesting circumstances in their history. The time then may come round again, when the cold affusion will arrest continued fever; so that it ought not to be forgotten among the remedies to which this property has been assigned.

[Professor Dunglison states, (*Prac. of Med.*, vol. ii., p. 490,) that he had many opportunities of witnessing this plan in the wards of the Royal Infirmary of Edinburgh, and in none of these cases did the disease seem to be arrested; but the violence of the symptoms was occasionally mitigated by it.]

General blood-letting has long been a favourite remedy in continued fever for a variety of purposes. In the present place some notice must be taken of its alleged power to cut fever short. It was employed to a great extent for many objects in the epidemic of 1817–20; and this is probably the period when its effect in abruptly arresting the disease was first fully established. In order to employ it efficiently with this view certain conditions must be attended to. It is to be used only in cases of synocha, or of synochus with a well-marked inflammatory stage. It should be resorted to not later than the sixth day, and if possible earlier. In the inflammatory fever of hot climates it is probably impossible to be too prompt in the use of the lancet after reaction is fairly formed. But in the epidemics of inflammatory fever which have prevailed in Britain since 1817, it is singular that blood-letting has rarely been of any service, if practised before the fourth day with a view of cutting short the disease. The remedy must be pushed nearly to the same extent as in febrile inflammations. A small quantity of blood, whatsoever its immediate effect, is never of service. Faintness ought always to be induced; but even the securing this result will not insure any probability of success, unless at the same time the quantity of blood withdrawn be considerable, such as twenty, twenty-four, thirty ounces, or upwards. In a very few cases so treated the pulse never returns to its state of

reaction, and the fever is substantially arrested, without the intervention of any other functional phenomena. In other instances, and these more frequent, the faintness is followed by perspiration ending in critical sweat; but more frequently still the febrile action revives, goes on in a mitigated form for a day, and is then terminated by a diaphoretic crisis. If not, the repetition of the blood-letting may bring on the crisis then, or on the subsequent day. Such is a sketch of the effects of general blood-letting in the remarkable epidemic of 1817–20, as well as in later epidemics down to 1828. Such particularly were the results where the remedy was resorted to on the fourth or fifth day of fever in young healthy subjects; diaphoretic crisis in such circumstances might be very confidently relied on before the close of the sixth and generally on the fifth day; whereas, in a majority of cases of the like kind treated without blood-letting, or left at home without treatment at all, the disease ran on to its secondary typhoid stage.

In the fevers which have prevailed for some years past these salutary effects of general blood-letting have ceased to be presented. It has been already repeatedly remarked, that for at least fifteen years continued fever has been gradually assuming more and more of the typhoid type over the whole country; but especially in Edinburgh has this change been strongly marked. A corresponding change has taken place in the effect of remedies, and of blood-letting more than any other. Many practitioners, trained to its use in previous years, continued for some time to adhere to it as the type of the disease changed; but all have long ago ceased to expect that, by such a measure fever may be broken abruptly in its progress.

2. The remedies which have been used for *mitigating the force of reaction* in the early stage of fever are exceedingly numerous. They comprehend also a large proportion of the best measures for abating or removing special symptoms and secondary local disorders. They are chiefly general blood-letting, local blood-letting, cold in various shapes, diaphoretics, and sudorifics, antimonial sedatives, cathartics, and low diet. Other remedies which have been also employed with the same view, may be more correctly considered as specifics, and will be noticed under the treatment of the advanced stage, to which they are probably more applicable.

General blood-letting has been much practised in all forms of fever since Dr. Armstrong recommended it in congestive typhus, and since its general introduction into the treatment of the inflammatory epidemic of 1817–20. Its use in arresting fever has just been adverted to. But it has been further practised to a great extent for moderating the force of reaction in the early stage of

all fevers, where reaction is at that period well-marked; and it is unquestionably a valuable remedy for this purpose, though there may be little expectation of cutting the fever short.

In order to use it with effect and safety the following conditions should be attended to:—1. It is most serviceable for moderating reaction in epidemics which tend to the inflammatory character, and in cases which put on the form of synocha or synochus. Although some also employ it in the early stage of typhus, the prudence of such practice may be greatly doubted; indeed, there is seldom such amount of reaction as to call for general blood-letting in a case of genuine typhus; and the symptoms which may seem to authorize it will for the most part be found to yield equally well to the milder remedy, local blood-letting. General blood-letting has been seldom resorted to, and never freely, in true typhoid cases of late epidemics, without reason being subsequently seen to regret it when the typhoid stage came to be fully formed. 2. It should be employed only where general reaction runs high, as ascertained by the state of the pulse, the animal temperature, and local signs of inflammation. 3. It should be regulated as to extent, partly, of course, by the age and constitution of the patient, and partly by the type in the particular case, but in part also by the prevailing character of the epidemic —larger evacuations being borne well in the same description of cases in inflammatory than in typhoid epidemics. 4. Of special criteria for regulating its extent, the safest and most precise is the state of the pulse both before the vein is opened, and likewise under the flow of blood. It is most useful where the pulse is incompressible, whether it be full or contracted, whether very frequent, or moderately so; and when it improves in softness if full, in fullness if contracted—but not under a very slight loss of blood. It is least useful and often inadmissible, where the pulse is easily compressible, whether soft or jarring, and whatever its frequency; and when, under the flow of blood, it becomes either more jarring, or easily and quickly feeble, and fluttering or slow. 5. The effect on the one hand upon the symptoms of reaction, and on the other upon the adynamia or nervous exhaustion, will generally decide whether the remedy has been correctly appealed to, and whether it ought to be repeated. And where doubts may remain as to repeating it, they may often be resolved by the state of the blood; which, if presenting a firm clot, and still more any appearance of a buffy coat, may warrant the repetition of the remedy; while a clot with little colouring matter, and a loose gelatinous consistence, commonly indicates the necessity of forbearance. On the whole, much practice and discrimination are required to use general blood-letting with advantage and even with safety, for moderating reaction in the first week of continued fever. If harm originated in the early epidemics of the last

twenty years, as many with justice have insisted from a dread of the lancet, there can be no question, on the other hand, that even in these epidemics, and still more in those of recent periods, equal injury has accrued from indiscriminate confidence in it, arising, it is presumed, from a disbelief in the doctrine, that fever consists essentially in part of primary nervous exhaustion, and from an overweening reliance in the theory, that this exhaustion is merely secondary to pre-existing reaction.

Local blood-letting is in all kinds and in all stages of fever a remedy of the first importance for a variety of purposes. Among other effects it has sometimes that of mitigating reaction in the early stage. This is accomplished in one of two ways—either by the quantity of blood withdrawn being such as to have in some measure the effects of general depletion, or by its singular power in removing local inflammation, even where the actual loss of blood is inconsiderable.

Cold is an approved means of subduing excitement in the early stage; and it may be employed advantageously in various shapes, such as cooling drinks, cool air and ventilation, cold effusion, cold sponging, the cold douche, and other modes of applying cold to the head.

It may seem superfluous to mention *cooling drinks* in the present day as one of the means of abating reaction and contributing to the patient's comfort. Yet it is not very many years since drink generally was looked on with distrust, and cold drink in particular prohibited. In continued fevers of every type, however, cold drink is longed for by the patient, and is properly allowed, but under two restrictions—first, that it shall be given in moderation at each draught to prevent disorder of the stomach being induced; and, secondly, that when diaphoretic crisis seems to approach or has commenced, cold shall be exchanged for warm drink. Patients in the early stage of fever are extremely capricious in their choice of drinks; and the physician should be prepared to indulge them with variety. Barley-water, water-gruel and toast-water, the staple drinks of some practitioners, are relished by few patients; currant-jelly water, capillaire-water and the like, are also seldom taken long; lemonade or orange-juice-water and effervescing powders are usually more palatable; the most pleasant acid drink, however, for fever patients is water acidulated with cream of tartar or sulphuric acid; but that to which they adhere longest and throughout every stage is soda-water, which, in most circumstances, may be allowed freely. When the first week is over, or even earlier, all medicated drinks are commonly loathed, and spring-water and soda-water alone relished.

[The abuse of the ordinary drinks administered in fever, is apt to produce flatulency, unpleasant distension of stomach and

bowels and increases the tendency to tympanitis. Fluids should be given in small quantities and at intervals. A weak infusion of cascarilla, or some other bitter, slightly acidulated with muriatic acid, often controls the thirst very effectually.]

It was at one time the practice to treat fever with warmth and close air to keep the fever out. It is long, however, since both physicians and patients found that comfort was better secured by *coolness and ventilation of the air;* which, therefore, now hold a prominent place among the measures for moderating reaction. But many push this article of regimen to excess, thereby occasioning local inflammations, and even, probably, undue depression, especially if they persevere with it also in the advanced stage; and accordingly there are some who, from dread of these results, seem inclined, even in these modern times, to revert to the ancient suffocating system. The truth is, no rule in regard to cold air and free ventilation applies in all circumstances. Hence the ordinary system of ventilation in hospitals, especially in winter, is bad, and all the worse that it is practised only during the visits of the medical attendants. The chief rules to be attended to are these:—The patient's own feelings are generally the surest test and may be safely trusted, so long as his mind does not wander, even though he demand what his attendants cannot endure. In inflammatory fever, and the early stage of almost all fevers, cool air is of essential service in mitigating restlessness and the violence of reaction, and should never be withheld except for strong special reasons. The marked benefit derived from gestation in the open air, which was first urged by Dr. Jackson, and has often been experienced in military and sometimes in civil practice, is probably in a great measure owing to coolness and ventilation. One must have had a severe fever to be aware of the luxury of fresh air and a breeze; and no one who has had that advantage will question their general utility. The rigour of cool ventilation must be moderated even in the early stage of fever, when serious local inflammation is present, at least in the larynx, bronchial tubes, pulmonary tissue, peritoneum, and intestinal mucous membrane. It must likewise be modified where there is irregular distribution of temperature, or much nervous exhaustion, and generally in the typhoid forms of fever, where the animal heat is little increased.

The *cold affusion* has been used for mitigating reaction as well as for cutting it short. Its utility for the former purpose seems governed by the same rules which govern its application to the latter. In fevers, which may be cut short by it near their commencement, it allays reaction at a stage too late for that result to be expected; in other fevers it is of doubtful service; and the more the disease tends to the typhoid type the more equivocal becomes the remedy.

Cold sponging of the whole body, or of the head, face, neck, chest, and shoulders, has been substituted with great advantage for the more energetic affusion. There are few fevers in which reaction is not mitigated for a time in the early stage, and the patient's comfort essentially improved, by this remedy, if faithfully persevered in. The heat of the skin, however, ought to be above the healthy standard; irregular distribution of temperature must not be present; and great nervous exhaustion is also a contra-indication. In such circumstances tepid sponging is properly substituted. There is no use in medicating the water with vinegar and the like, except to inspire the attendants with more trust in the remedy, and thus secure its faithful application.

The *cold douche of the head, wet evaporating cloths*, and the *ice-bag*, are often of great service in moderating reaction; but their influence is probably indirect, through means of their operation as local remedies in moderating determination towards the head.

More reliance, perhaps, has been placed in *antimonial sedatives* for allaying reaction in the early stage of continued fever than in any other remedy. Antimonials have been used in three ways in this stage—according to the contra-stimulant plan in frequent large doses, in small doses as nauseating sedatives, and in still less doses as diaphoretics. The contra-stimulant method, the theory and details of which are explained in other parts of this work, and which, if not first conceived, was at all events first successfully propagated as a doctrinal practice, by Rasori, consists in the administration of doses of tartar emetic every two hours, varying from one to two or five grains or upwards; and it is represented that the effect is simply to reduce reaction, to act as a constitutional counter-stimulant, without necessarily any other physiological action being developed among the various actions of the kind possessed by this antimonial preparation. By this method Rasori maintained that very many febrile diseases, and continued fever among the rest, may be successfully treated. Without presuming to decide the general question of the efficacy of such practice in continued fevers at large, it may be simply mentioned, that no success whatever has attended the trials made of it in the late fevers of Britain, and that the contra-stimulant phenomena even have not been witnessed at all. And as a proof of the fairness with which these trials have been conducted, it is right to add, that in the hands of those who made them, the same practice was found to elicit in pneumonia and some other organic inflammations all the essential phenomena which Rasori describes. The method by nauseating doses of James's powder and tartar emetic, is a much more ancient and general practice than the Rasorian plan. It was much confided in by Cullen, and continues still a favourite system of cure both among his disciples and others.

It appears well established, that doses of about a quarter of grain of tartar emetic given every one, two, or three hours in one or two ounces of some convenient liquid vehicle, so as to keep up nausea, with as little vomiting as possible, will often contribute in some fevers to keep down reaction in their early stage. But in many epidemics the effect of this kind is slight and equivocal. Especially has this been the case for some years past in the British continued fever: so that, although still generally pursued by many, the practice seems rather to rest on routine prejudice, than on satisfactory evidence of its utility. It appears on the whole most serviceable in the early stage of those forms of synochus which approach to typhus, and may be in them advantageously substituted for general blood-letting. The result is never in any case at all to be compared with the effects of the same practice in the advanced stage of some febrile inflammations, such as pneumonia, or in the early stage of erysipelas. As to the third method of administering antimonials, namely, as diaphoretics, all that can be said on this head may be equally well stated under the head of diaphoretics in general.

In 1817, when the rising medical generation first saw continued fever on the large scale, they found almost every case treated as a matter of course with *diaphoretics*. The pharmacopœia of every hospital teemed with diaphoretic formulæ, in which acetate of ammonia and tartar emetic performed a conspicuous part, and of which every fever patient had his share. It was universally observed, however, that the diaphoretic plan, whether by antimonials or otherwise, was of no avail; diaphoretic mixtures were banished, except from routine practice; and this method has never regained any footing since. The truth seems to be, that in some forms of sporadic fever of a mild kind, especially those occurring in children, which are not referable to infection, and which approach in nature to irritative gastric fever, diaphoretics are often singularly serviceable, but particularly the solution of acetate of ammonia in two-drachm or half ounce doses frequently repeated, or frequent doses of an eighth of a grain of tartar emetic largely diluted, or James's powder, to the extent of three, five, or seven grains occasionally. But when fever assumes the epidemic form in cases referable to infection, this practice is wholly futile. We are bound to receive with deference the favourable statements of the physicians of the last century on this matter. But the truth cannot be denied, that their great antiphlogistic weapon, the diaphoretic method of cure, has proved pointless in all recent British epidemics. Sudorifics have been less extolled at all times in fever; and it is apprehended that few now think of employing them in the well-marked and severe forms of epidemic fever, where, if they were useful at all, there would not be long wanting satisfactory evidence of their efficacy.

The employment of *cathartics* for checking early reaction in fever first became general about the beginning of the present century, through the writings of the late Dr. Hamilton of Edinburgh. Like other enthusiasts, Dr. Hamilton pushed too far his confidence in his favourite method; and some of his imitators brought it into discredit by trusting to it alone where more powerful and instant means were necessary, or by resorting to it in circumstances of great exhaustion, where neither the discharge occasioned by free purging, nor the consequent fatigue, could be borne with impunity. In all cases of continued fever in the early stage, unless where some peculiar contra-indication occurs, mild laxatives, such as moderate doses of senna, castor-oil, rhubarb and magnesia, aloetics, and the like, are essential in modern British practice for counteracting the tendency to constipation, which is very regularly present at this period. More active doses of senna, the compound colocynth mass, neutral salts, fortified or not by tartar emetic, are also prevalently resorted to at first for occasioning brisk purging; because such a measure is clearly found serviceable in keeping down febrile reaction. Perhaps no combination in general answers better for the purpose than either the compound colocynth mass at night, followed by sulphate of magnesia or some other neutral salt in the morning, or a solution of an ounce and a half of sulphate of magnesia, and two grains of tartar emetic in twelve ounces of water, of which two, three, or four ounces are given every hour, or alternate hour, according to the effect produced or desired. The refrigerant sedative action of such treatment is often unequivocal. In cases of typhus of the pure kind, especially where the adynamia is great and early, the purgative method must be mitigated and confined to simple evacuation of the contents of the bowels. The exhaustion is otherwise dangerously increased; and even hazardous fits of fainting are induced by the frequent exertions which are rendered necessary. In cases, too, where inflammation of the intestinal mucous glands is formed or threatened, it is commonly held by those conversant with the particular form of fever, that all purgatives except the gentlest are inadmissible. But others, admitting their questionable service in such circumstances, also with some show of reason add, that the local disease of the bowels is in all probability apt to be developed in consequence of the physician neglecting the bowels while in a state of protracted constipation.

Low diet is an indispensable part of the treatment in the early stage for subduing general reaction. But the physician is seldom put to much trouble in prescribing this measure, since nature generally enjoins it by removing the appetite; and the principal duty of the medical attendant is confined to controlling the indiscretion of friends, who will often be scarcely persuaded that

a patient in fever may live with little or no food for days and weeks together. The simplest farinaceous articles, and even these in small quantity, with tea and such other slightly nutritive liquids, constitute the brief diet-roll of the fever patient in the early stage of his illness.

3. The last of the indications of cure in the early stage of fever is *to abate and remove local disorders and special symptoms.* The most important remedies which come under this head are those employed for arresting local inflammation; which will therefore be mentioned in the first instance.

Secondary local inflammations may be often arrested by the same means which are rendered advisable for subduing general reaction. Hence they are often removed when reaction in the early stage is mitigated; and more frequently they disappear, although the reaction, the more direct object of the treatment, should, as often happens, continue unabated. Local inflammation in fever is for the most part much more easily subdued than either the fever itself or idiopathic inflammation. It is seldom, for example, that general blood-letting is required for this alone. Local evacuation of blood is commonly sufficient; and where there seems a necessity for opening a vein, the loss of blood required is comparatively inconsiderable. Hence in the laryngitis, catarrh, pneumonia, and other local inflammations of fever, the employment of a few leeches may generally prove an active enough remedy, so far as evacuation of blood is concerned; and this observation applies peculiarly to those epidemics which tend to the typhoid type. Blisters are also often of effectual service, especially in catarrh, pneumonia, and gastric irritation, where they frequently act with energy although local depletion has failed. Rubefacients even are sometimes of service, especially in cynanche tonsillaris and the slighter form of laryngitis, which in these climates is a common accompaniment of fever. Tartar emetic in nauseating or diaphoretic doses is useful for combating local inflammation, particularly catarrh and pneumonia, although of little moment as a general antiphlogistic against the fever itself. In cynanche tonsillaris some advantage is derived from the customary stimulant gargles; in laryngitis, from mucilaginous demulcents and inhalation of warm water and vinegar; in bronchitis, from expectorants, more especially squill united in the form of a mixture of the syrup with laudanum or muriate or acetate of morphia; in cynanche parotidæa, from warm fomentations and poultices. In entero-mesenteric inflammation, which seldom however commences, or at least betrays its presence, in the early stage of fever, the most promising treatment consists in the application of leeches repeatedly to the abdomen, particularly in the right iliac region, the faithful employment of fomentation, the administration of large doses of chalk mixture with half-drachm

doses of ipecacuan wine and a little laudanum, the use of gently anodyne clysters, where the diarrhœa is very troublesome, and perhaps gentle mercurialization of the system, with occasional gentle laxatives where other remedies induce too constipated a state of the bowels, or, instead of laxatives, gently stimulant clysters.

Of other local affections the most material are determination of blood towards the head, and gastric irritation. Headache, a symptom seldom entirely wanting, and always when present much complained of, is most effectually relieved by leeches and cold evaporating cloths. In fevers of a typhoid tendency the former remedy is the more effectual of the two. It is indeed surprising to observe, how often a few leeches in the early stage of typhus, or typhoid synochus, will remove or materially mitigate headache for the rest of the fever. When, on the other hand, the tendency of the fever is to the inflammatory type, cold evaporating cloths are usually more serviceable, particularly when preceded by leeches: but, to do any good, they must be applied much more carefully than is customary, especially in hospitals. In severe cases, a bladder half filled with broken ice may be advantageously substituted for wet cloths; but it must be observed that few patients can bear for more than a few minutes at a time the pungent impression thus made upon the integuments, and that the ice should be frequently removed for a short interval. The ice-bladder is particularly serviceable where headache is combined with much heat of the integuments of the head, and generally in all cases where the symptoms appear to threaten secondary local inflammation. Cold ablution of the head is preferred by some patients, and is also an excellent remedy. [Dr. Graves is of opinion that warm applications are applied much less frequently than they ought to be for the relief of headache and cerebral symptoms. Warm vinegar and water, he says, will generally be found to be the most efficacious application in the ordinary headache of fever.] Convulsions with coma, occurring in the early stage of fever, were stated in a former section to be invariably fatal. Copious blood-letting from the arm, as well as the temporal artery, the ice-bag to the head, powerful cathartics, the warm bath, and on the other hand also stimulants, have been tried in the cases observed in Edinburgh, but without making any impression on the disorder.

Gastric irritation in fever may amount to inflammation, and is often treated successfully as such by leeches and blisters to the epigastrium, occasionally united with gentle anodynes. But the same remedies are also frequently very useful, where no doubt can exist that the nature of the affection is irritation at most, or nervous and functional. Tenderness at the pit of the stomach, a common symptom, is most effectually subdued by leeches, par-

ticularly in typhoid cases. Sickness and vomiting are sometimes relieved by frequent small quantities of cold drink, sometimes by effervescing draughts, more generally by leeches, but best of all by a blister over the stomach.

In the hepatic affection, described among the secondary abdominal diseases as an occasional accompaniment of fever in the early stage, and as characterized by a jaundice colour of the skin, and, commonly, bilious stools, the most efficient treatment is prompt mercurialization. Such cases have generally been observed in the epidemics of Edinburgh to resist all other remedies, and to prove swiftly fatal, with extreme prostration. But in several instances, where calomel was given in a large quantity, to the amount, for example, of a drachm in twenty-four hours, recovery took place; and the crisis was coincident with the first appearance of mercurial action.

Such are the leading points to be attended to in the treatment of continued fever in its early stage. This stage, it has been often observed, commonly lasts for one week. When the fever continues longer, the nervous exhaustion begins to predominate, reaction declines, typhoid symptoms are soon developed, and new indications arise in the treatment. These may sometimes originate, however, long before the close of the first week, occasionally even near its commencement. The necessity, therefore, of a very different plan of treatment from any yet mentioned, being required, in some instances, at a very early period of fever, must never be lost sight of. But in a very great majority of cases, no such necessity arises till the close of the first, or beginning of the second week; and it is observed that, on an average, those cases do best where antiphlogistic or "expectant" treatment may be continued till then.

Treatment of the middle stage.—The middle stage of fever, as characterized by time, may be said to extend from the close of the first week to between the eleventh and seventeenth days. But, more correctly, it comprehends the interval between the period when the symptoms of nervous exhaustion begin to predominate, and the period when a favourable crisis is promised, or a fatal event is threatened. In this stage, the objects of treatment are to mitigate reaction, to support exhaustion, and to subdue local disorders.

1. In many cases and epidemics of fever, which present a marked typhoid character, the force of reaction in the middle stage is so inconsiderable, that it may be almost disregarded in the treatment. But in other cases, and in particular epidemics, reaction continues an important object in the method of cure, and not the less so, that it is complicated with some degree of nervous exhaustion or typhoid depression. Accordingly, it happens sometimes that, for this purpose, the active antiphlogistic mea-

sures of the early stage may be requisite even in the course of the second week. Far more generally, however, the practitioner must bear in mind that exhaustion of the strength, the indirect result of previous excitement—as well as the development of the primary nervous depression, which is never wanting in one degree or another in any case of fever—renders it indispensable to mitigate materially the energy of the antiphlogistic method.

More especially do these remarks apply to the use of general blood-letting. The employment of it may be governed by the same rules as for applying it to the treatment of reaction of the circulation in the early stage. But the contra-indication, arising from the risk of injuriously augmenting exhaustion, is doubly strong in the middle stage. Much practice is required to use it judiciously at this period. The general rules are, to observe carefully the prevailing character of the epidemic, the particular type of the case, and the condition of the pulse. And, in judging from the state of the pulse, care must be taken not to err, as the inexperienced are apt to do, by mistaking for a firm pulse of reaction the full, jarring, but easily extinguished pulse, which is common in the middle stage of fevers of the typhoid or adynamic type. On the whole, the prevailing impression seems to be, that general blood-letting is, for the most part, a questionable remedy for abating reaction in this stage; that more injury than good has been done by its introduction into practice with that view, in consequence of its having been used too indiscriminately by the inexperienced or the prejudiced; and that a better indication for its employment is the removal of congestion of internal organs.

Of other antiphlogistics, cool air, cold drinks, and cold or tepid sponging, are much in use for moderating reaction in the middle stage. Their extent and degree must be regulated by nearly the same conditions as in the early stage, and always mitigated where exhaustion is great, or the temperature of the body either irregularly distributed, or not elevated. Antimonial sedatives are of no use; and the whole class of diaphoretics are equally inefficacious. Such, at least, is the experience of practitioners in the epidemics of the last twenty years. Cathartics are of more general application than other antiphlogistics. A moderately open state of the bowels, by means of any of the purgatives formerly mentioned, seems to answer better in the generality of cases of primary continued fever in this country, than any other means of counteracting general excitement in the middle stage. But, for reasons formerly given, they must not be used too freely; and all drastics must be shunned, where the primary nervous exhaustion, or secondary depression, is very great. And, likewise, they are contra-indicated by entero-mesen-

teric disease. Where debility forbids the use of purgatives, it is essential to maintain the bowels open by means of clysters.

2. The counteracting of exhaustion is, in a majority of cases of fever, the most important object of treatment during the middle stage. In not a few cases, as already observed, it even becomes an essential part of the system of cure in the early stage. Pathologists have indicated two varieties of nervous exhaustion as occurring in the middle stage of fever, one primary and essential, produced directly by the cause which excites the fever, the other secondary, the consequence of antecedent reaction, and observing some ratio to the degree of that reaction. Although this is probably a correct distinction in a pathological point of view, it is of no great moment, so far as regards the remedies for the state of exhaustion; for in either case it may be similarly treated.

The chief remedies for exhaustion are wine and other alcoholic fluids; to which some add camphor, opium, chlorine, yeast, certain saline mixtures, and mercurialization. The food also at this period sometimes requires regulation. Some of these remedies, indeed, may be regarded more correctly as administered in the shape of specifics, than as mere stimulants for counteracting exhaustion. But they may nevertheless be considered, without great impropriety, under the present head.

When the state of exhaustion is well marked, it is seldom possible to do without wine or some other alcoholic fluid. Wine is commonly preferred, and in this country the stronger wines are thought most suitable. But when the adynamic state is very great, the stimulus of wine is sometimes insufficient, and it becomes necessary either to add strong spirit to the wine, or to substitute diluted spirits. This step is often peculiarly necessary in the instances of habitually intemperate livers, in whom wine, in such quantity as may be conveniently administered, has little or no effect, simply because their constitutions have become proof by habit against the influence of weak potations. Malt liquors can seldom be used instead of wine or spirit, because they are not strong enough for ordinary purposes, and because they are apt to disorder the stomach by means of their extractive ingredients. The quantity of wine or spirit which is necessary, varies exceedingly. No definite rule can be laid down on that point. Generally it is right to limit the first administration to four ounces, or two wineglassfuls of wine in twenty-four hours. Many patients, however, eventually use a whole bottle without injury, though previously unaccustomed to any alcoholic fluids; and even this amount is not unfrequently exceeded. A person not habituated even to wine, has been known to take for a short time two bottles of port and half a bottle of brandy, without any other than a salutary effect on the pulse and general course of the disease; but this is an extreme case. The wine may be given alone, or made

into drink with cold or warm water: and an excellent mode of administering it, where the patient is not too torpid, is with a little soda-water.

The best indications for wine are a soft and not jerking pulse, a tongue without much yellow or white coating, a temperature not particularly elevated, paleness, or at least diminished flushing of the face, the absence of local inflammation, and a drowsy torpor, without either high delirium, or, on the other hand, profound coma. The opposite signs are not always contra-indications; but, when any of them are present, wine is not so certain a remedy; and some of them imply preliminary or cotemporaneous treatment of another kind. A small wiry, or full hard pulse is commonly a positive contra-indicant. So, too, are a very foul loaded tongue, considerable elevation of temperature, smart local inflammation, much flushing of the face, with heat of the head, pulsation of the temporal arteries, and other symptoms of cerebral determination of blood. High delirium and deep coma are not always contra-indicants, as they may arise from excess of depression; but they are sometimes associated with obvious determination towards the head, or congestion of the brain; and in that case stimulants should be avoided for a time, or more frequently treatment by general stimulants should be combined with local treatment by leeches, cold, and blisters, as will presently be described under the head of remedies for the secondary disorders of the middle stage.

The proper time and occasion for commencing the use of wine often involve a very nice practical question. On the whole, more harm is done by resorting to it too soon, than by withholding it too long; and it is right, if possible, to get the patient through the first week before administering it; which is generally practicable, except in marked typhoid cases. As in many circumstances some doubt will exist whether the time for it may have arrived, great consequence is always attached to close observation of the effects of the first few doses. If the pulse become more frequent, or more jarring, or the tongue more dry, or the flushing of the face worse, or the breathing quicker, or the stupor deeper, or the delirium or restlessness greater, it must be abandoned. If the pulse expand, or soften, or lose its jarring character, or fall in frequency; if the tongue becomes softer, moist on the edge, and more easily protruded; or the countenance continue clear, with the eye more lively, or the breathing softer and less noisy, or the stupor more easily interrupted and more similar to mere sleepiness, or the delirium and restlessness less considerable—the remedy has been appealed to at the proper conjuncture, and may be continued.

[Dr. Stokes has proposed to deduce from the cardiac phenomena, a rule to regulate the administration of wine and other stimulants in continued fever. His proposition is: *that in the*

diminished impulse, and in the feebleness or extinction of the first sound of the heart, we have a new direct and important indication for the use of wine in typhus fever. In typhus, according to Dr. Stokes, there are two conditions of the heart diametrically opposite. In the one, the impulse is either altogether wanting, or very feeble, with a diminished intensity of the sounds. In the other, the heart's action continues vigorous throughout the progress of the malady. The state of the skin is not an index of these two cardiac conditions; the surface frequently giving the sensation of intense heat, whilst the heart's action is feeble. And, on the other hand, the converse holds good; an alarming rapidity in the cardiac action, with every appearance of utter prostration, the patient being cold, pulseless and livid. The condition of the circulating organ must be determined by the application of the hand and the stethoscope, to the infra-mammary and sternal regions. Dr. Stokes supports his views by a number of illustrative and confirmatory cases. Dr. S. regards the action of wine upon the heart in typhus, as both sedative and stimulant: sedative in diminishing its frequency; stimulant, in restoring its impulse and muscular sounds. In other cases, the existence of the cardiac phenomena at an early period of the disease, led him to anticipate the bad symptoms, and to commence in good time the use of the great remedy; and in others, notwithstanding the presence of severe visceral irritations, the use of stimulants was adopted with the best success, from the same indication. The experience of Dr. Pennock, of this city, supports that of Dr. S.* Dr. Stokes expresses his solemn conviction that it is to the fear of wine in typhus, as well as to an ignorance of the principles which should guide its exhibition, that the immense mortality in this affection is to be mainly attributed; he adds, that in no previous epidemic had he given so much as in the one he is treating of, and in none was he ever so successful. In one case the amount of stimulants employed was enormous; and although of a most unpromising character, it terminated happily. The patient was an elderly woman, admitted in a state of great prostration, three weeks after the invasion of the disorder. Wine, 292 oz.; Brandy, 20 oz.; Porter, 7 bottles; Ethereal enemata, 2 bottles; besides jelly, beef-tea, &c. Dr. Graves considers that suffusion of the eyes should not contra-indicate the use of wine, as it may result from want of sleep; nor a hot skin, particularly where there is, at the same time, a tendency to coldness of the extremities.]

It sometimes happens, that, where wine has thus been properly administered, although it acts for a time beneficially, yet in twenty-four hours or upwards it begins to act injuriously, producing the contra-indicating phenomena just mentioned. This

* [Med. Examiner, vol. vii., p. 123, 1843.]

is a circumstance not always adverted to by those extravagantly addicted to prescribing wine in fever. But it certainly does appear as if sometimes nature were the better for a little temporary impulse in the shape of wine, and nevertheless cannot stand continued stimulation. Observations of this kind occur particularly in synochus, and, above all, where the preliminary stage of reaction is distinct. On the contrary, it is a far more general rule, that where wine has been clearly proved by its first effects to be a proper remedy, the artificial stimulus, once obtained, must be regularly kept up by stated doses, which must be also occasionally increased. Attention to this rule is especially necessary in the night-time and towards morning, when the state of depression is at the lowest. The fidelity of the personal attendants of the sick during this period should be scrupulously insured if possible. It is well known to hospital physicians, that not a few severe cases of fever in the typhoid state are lost in consequence of being neglected in the night-time, and left for some hours without the stimulus which they had been accustomed to receive during the day.

Little need be said of the other remedies mentioned above, as occasionally employed to counteract typhoid exhaustion. *Opium* has been used by a few in frequent small doses as a stimulant; but its fitness for this purpose is generally distrusted, and the danger arising in the latter stage of typhus and synochus from congestion, especially of the brain, seems a sufficient contra-indication.

[The employment of opium in fevers is a point of great nicety, requiring extreme caution and discrimination. The indications for its use have been accurately stated by Drs. Latham and Stokes. "When the disorder of the sensorium outruns the other symptoms; when by venesection or topical bleeding, or by alvine evacuations and refrigerants, the general and local symptoms are relieved, but the delirium still continues; when to this state are added tremors, subsultus tendinum, and unrestrained evacuations; when there has been, at first, high vascular excitement, and large evacuations have been required to guard the brain or other organs from mischief, and wild delirium has followed; if the patient has previously been in a delicate or nervous state; if he has been addicted to an excessive use of spirituous or vinous liquors, particularly the former; if the habits of the patient and his occupations have been such as to inordinately excite and exhaust the sensorium; or if the anxieties, the toils, or the debaucheries of life have previously injured the health, and more especially the state of nervous energy; in these several circumstances should opiates be resorted to in the advanced progress of typhoid fevers, and of synochoid fever that has passed into the nervous or typhoid

state."* Dr. STOKES considers that *these* circumstances demand the use of opium in fever. 1st. Where there is persistent watchfulness. 2d. Where an inflammatory condition of the brain has existed and been subdued, but delirium or other nervous symptoms still remain. 3d. Where an excited state of the sensorium exists without heat of scalp, or remarkable throbbing of the arteries of the head. Dr. WATSON says that it is in that form of fever, called by the French *ataxique*, where the patient is affected with delirium, restlessness, wakefulness and spasm, and the disturbance of the nervous system outruns that of the vascular—a condition closely resembling that of delirium tremens—that opium is so beneficial. Where the symptoms are well-marked, a tolerably full dose of opium, or one of its preparations, may be given in the evening. "But," as Dr. LATHAM remarks, "there are cases where the indications for the employment of opium are *doubtful*. Wild delirium and long wakefulness, and a circulation weak and fluttering, seem to call for a considerable dose of opium. Yet withal there is a certain jerk in the pulse, so that we cannot help *suspecting* that the blood-vessels have something to do with the sensorial excitement. Under these circumstances I have certainly seen twenty minims of laudanum produce tranquil sleep, from which the patient has awoke quite a new man. But I have also seen the same quantity produce a fatal coma, from which he has never been roused. Now since it is a fearful thing to strike a heavy blow in the dark, where the alternative is of such magnitude, it is the safest and best method to administer a small dose, at intervals of an hour or two, so as to stop short of actual mischief at the first glimpse of its approach, or to be led, by a plain earnest of benefit, to push the remedy to its full and consummate effect. Many doses may be required for this purpose; but we shall see, after the first or second, whether to go on or to desist." Dr. PEREIRA says, "Yet I have seen opium fail to relieve the delirium of fever, even when given apparently under favourable circumstances; and I have known opium to restore the consciousness of a delirious patient, and yet the case has terminated fatally. If the skin be damp, and the tongue moist, it rarely, I think, proves injurious. The absence, however, of these favourable conditions by no means precludes the employment of opium; but its efficacy is more doubtful." (*El. Mat. Med.*, Am. ed., vol. ii., p. 704.) Dr. HENRY HOLLAND suggests that the condition of the pupil may serve as a guide in some doubtful cases—where it is contracted opium being contra-indicated. (*Med. Notes and Reflections*, p. 427, 2d ed.) Dr. GRAVES has extolled, in extravagant terms, a combination of tartar emetic and opium in continued fever with prominent cerebral symptoms.

* [Latham, in Lond. Med. Gaz., vol. x., p. 11.]

℞.—Ant. et potas. tart. gr. iv
Tincturæ opii f℥i.
Aquæ camphoræ f℥viiij.
M.
Sig.—Half a tablespoonful to a tablespoonful every two hours.

This treatment Dr. G. claims as "peculiarly his own." Dr. Law, of Dublin, recommended it through the columns of the *London Medical Gazette* previously to any publication on the subject by Dr. Graves.*]

Camphor was highly thought of by Cullen, and is still administered by many, partly as a sedative of the nervous system to allay inordinate irritability, partly as a stimulant of the circulation to counteract debility. It is given in the form of emulsion, and in the dose of one or two grains every four or six hours. Cullen, however, urges that the smallness of these doses was the reason why many practitioners complained of not obtaining the good effects he announced; and that five grains ought to be administered at a time. Now-a-days few put any trust in this remedy in a genuine and severe case of continued fever.

[Dr. Gerhard derived great benefit from the use of camphor in the Philadelphia epidemic of 1836, where the nervous symptoms were prominent. "Camphor," he says, "was certainly amongst the most useful and powerful of our remedies. We used it largely in the severe cases, especially those in which the ataxic nervous symptoms were very marked; and we had no reason to repent its employment. In general there was a marked diminution of some of the most prominent and harassing symptoms. We gave the camphor in emulsion in doses of five grains, every two hours, and in enema in doses of a scruple. The immediate effect was the lessening of the subsultus and tremors, for which it was chiefly administered, and sometimes the diminution of delirium. In some cases we possessed a complete control over the subsultus, which was immediately checked by an injection containing a scruple of camphor. It would cease for some hours, but afterwards return nearly with its former severity. Still it was a useful palliative, and, like most remedies of its class, acted as a useful balance-wheel in preserving the harmony of the system until the disease had passed through its natural course. The camphor frequently acted powerfully as an anodyne when sleep had been interrupted by the previous disturbance of the nervous system." Huxham is high in his praise of camphor. "Its anodyne demulcent quality," he says, "makes it vastly serviceable, in quieting the *erethism*, and bringing on composure of spirits and easy sleep, when opiates fail, nay augment the tumult and hurry."]

* [Lond. Med. Gaz., vol. xviii., pp. 538-694.]

In recent times, among other new remedies for fever, *yeast*, in frequent doses, has been proposed as a means of opposing exhaustion; but it has not come into so general use, that any opinion can be formed of its utility. [This remedy has been used extensively by Dr. Stoker, who, after an experience of thirty years with it, speaks highly of it, in all the stages of typhus. It is not only seldom rejected by the stomach, when any other medicine can be retained, but the patient, in such cases, often expresses a liking for it. Yeast has been objected to on the ground of its being likely to increase tympanitic distension. Dr. Stoker, however, states, that in some of the most obstinate cases of tympanitis, enemata of yeast and assafœtida have proved the most efficacious remedies. According to this authority yeast is laxative, and supersedes, in a measure, repeated doses of purgative medicine. He ascribes its efficacy to the power of correcting the morbid contents of the alimentary canal, and consequently the symptoms of putrescence, and asserts that, in his idea, petechiæ and black loaded tongue will be found more effectually remedied by it than any other medicine. Dr. Tweedie says, "from our personal experience of yeast, we certainly think it a remedy deserving attention in the low forms of fever." (*Cyc. Pract. Med.*, Am. ed., vol. ii., p. 196.) It may be administered alone, or with any medicine which it may be advisable to join with it. Two tablespoonfuls may be given in water, or with an equal quantity of camphor mixture, every three hours. Should it purge too much, a few drops of laudanum may be added to each dose. If the stomach is irritable it may be given in the form of enema, four ounces being mixed with an equal quantity of gruel.]

The same may be said of *chlorine* in the shape of chlorine-water: at first employed as an antiseptic in the days when putrescency of the fluids was a received dogma in the pathology of fever, it has been more recently recommended as a stimulant, or a specific against the typhoid state. But no satisfactory evidence has hitherto been adduced in its favour.

[Dr. Copland, whose experience on this point has been considerable, says, "the *chlorinated soda* is a valuable medicine in all the typhoid forms of fever, when judiciously prescribed. It may be given early in the putro-adynamic variety, when excitement is imperfect or low, and the skin discoloured, or petechiæ are appearing, and continue throughout the disease. But when vascular reaction is considerable, or local determination prominent, particularly in the nervous and exanthematic varieties, this substance should be withheld until these states are subdued, or about to lapse into the nervous stage. At first, it ought to be prescribed in small doses, so as not to offend the stomach: in from ten to fifteen drops of the solution, as prepared by Labarraque, every three or four hours in camphor julep, or in an

aromatic water. As the disease passes into a state of exhaustion or of manifest putro-adynamia, or when there are a lurid skin, low, muttering delirium, stupor, meteorismus, black sordes on the tongue, teeth, &c., the supine posture, unconscious, offensive evacuations, petechiæ, blotches, a disposition to gangrene in parts pressed upon, coma, &c., it should be given in larger doses, or more frequently, and in tonic infusions or decoctions, or with camphor, serpentaria, or other stimulants and tonics. I have seen it productive of great benefit in such cases, but it should be commenced before these symptoms appear, and be persisted in, as its good effects are seldom manifest in less than three or four days, or more; and it should not supplant the use of wine, opium, suitable nourishment, and other means which the stage of the disease and peculiarities of the case may suggest. It should also be frequently administered in enemata; and the surface of the body ought to be often sponged with a stronger solution of it in warm water, with the addition of camphor. M. Chomel has lately given the chlorinated soda an extensive trial; and he states that it has proved more successful in low fevers than any other means, when perseveringly employed. Dr. Graves has also recently employed it, and has found it extremely serviceable. It acts, first, on the tissues with which it is brought in contact as a gentle stimulant and antiseptic, and is most probably partially decomposed in the digestive organs, and reduced to the state of common salt. In this state it is carried into the circulation, where it supplies the waste of this substance that has taken place in the early stage of the disease."]

Much interest was excited a few years ago in this country by the *saline treatment* of fever, a novel mode, originating in the doctrines of Dr. Stevens, relative to the dependence of fever on alterations in the blood. Conceiving that fever arises in loss of the saline ingredients of the blood, he naturally proposed to make good that loss by administration of the proper salts; and accordingly to trust the cure of the disease mainly to frequent doses of muriate and carbonate of soda, united with a little of the chlorate of potash. This treatment Dr. Stevens represented to be so successful in the remittent and yellow fevers of Trinidad, that upon one occasion 340 cures were accomplished in a military corps without a single death; and again, during an interval of nearly two years, 1010 cases were treated with a mortality of only one in ninety-two. It remains for Dr. Stevens' brethren in the West Indies to say, whether these statements are conclusive or fallacious—which has not yet been done. Meanwhile, the notion that such treatment will apply to the typhoid fevers of temperate countries is erroneous. In the trials made of the saline method in Edinburgh, no advantage whatever could be observed in well-marked cases. The treatment, moreover, is based on what ap-

pears a grave pathological error; for the reduction of the saline materials of the blood in fever does not exceed the reduction of the colouring matter, the changes of which in respiration the salts are intended to secure, and the alterations of the blood, so far as they have been hitherto determined, are consecutive, not primary—the effect, not the cause of fever.

[When Dr. Stevens commenced the saline treatment, he prescribed a strong solution of the muriate of soda with nitrate of potash, except in cases where there was acidity of the stomach. He now recommends a combination of twenty grains of the chloride of sodium, thirty grains of the carbonate of soda, and eight grains of the chlorate of potash. He administers this powder, dissolved in water, every two or three hours, according to circumstances, during the middle and last stages of fevers. According to Dr. Stevens, these salts enter directly the circulation, and do not irritate the stomach and bowels; and if given before the stomach has ceased to perform its functions, the bad symptoms soon disappear. A solution of the chloride of sodium (two tablespoonfuls to a pint and a half of tepid water, or thin gruel) may also be occasionally thrown into the bowels. The strength is at the same time to be supported by strong beef tea. In extreme cases Dr. Stevens thinks life may occasionally be saved by injecting a saline solution into the veins.

The *chlorate of potash* was recommended by Garnett and other writers, and more recently by Dr. Hunt, of Manchester. Dr. Copland has prescribed it since 1819, and considers it as a valuable medicine, especially in the advanced stages of typhoid fever. When excitement, or vascular reaction, is about to pass into the nervous stage, and when inflammatory determination has been removed, the same authority adds, this salt will be prescribed with benefit. Dr. Watson states that he has long employed it with advantage; and under its use he has remarked, in many instances, a speedy improvement of the tongue, which, from being furred, or brown and dry, has become cleaner, and moist. It may be conjoined with tonics and camphor, or it may be given in doses of five or seven grains, every two or three hours, in tonic infusions, or in larger quantities at longer intervals; a drachm may be dissolved in a pint of water, and a pint, or pint and a half of this solution given daily.]

The *mercurial method* of treating continued fever has at various times had its advocates, but it has never come into general use. Its followers maintain that the antiphlogistic properties of mercury render it peculiarly applicable to the removal of fever; that, the development of mercurial action being incompatible with another action going on at the same time in the system, fever must cease where mercurial erethism is excited; and in particular that, by its influence in rousing the energy of the capillary

vessels, it has a salutary effect upon their state of congestion in the latter stage. Many, however, deny that these theoretical views are realized in practice; and, on the whole, the preparations of mercury, as mercurials, are little used in the present day. From the trials made in late Edinburgh epidemics, it would appear that the induction of mercurial erethism has sometimes a good effect in the instances of congestive typhus where the head is peculiarly affected; that in such cases, however, mercurial action is not easily excited; that in other varieties of fever it is less serviceable; and that where its immediate advantage seems undoubted, much suffering and injury to the constitution may be occasioned by its ulterior effects.

The *regulation of the food*, in the middle stage of fever, is sometimes to be conducted upon different principles from those simple rules which have been seen to direct this branch of the treatment in the early stage. For the most part, indeed, the patient refuses aliment of every sort, even in the middle stage; and where a little food is taken, his tastes confine him to simple farinaceous articles—the only alimentary substances which at this time the stomach can generally endure. Towards the close of this period, however, especially in cases of typhus or synochus of a severe description, where there are great languor and exhaustion of the bodily powers, the patient will sometimes surprise his immediate attendants by suddenly demanding animal food. It has been found that, wherever such request is not dictated by mere incoherent rambling, it may be safely acceded to, and is, even in circumstances otherwise most unfavourable, a very propitious sign. In all cases, and in all stages of fever indeed, except in convalescence, the dictates of nature in respect of food may in general be followed without risk of injury.

[A cardinal point in the treatment of typhous fever is attention to the diet of the patient—to prevent, indeed, his dying of starvation. It is a well-known fact that protracted abstinence from food will induce a train of symptoms analogous to those observed in the worst forms of typhus. A rigorous abstinence observed during the course of so protracted a disease as typhous fever, is a mean by which much harm has been done. After the third or fourth day of the disease, nourishment should be given, and perseveringly continued in during the course of the disorder. Gruel, panado, —the farinaceous articles generally—should be allowed in small quantities, frequently during the day, at first. Broths, jellies, &c., become necessary at a later period.]

3. The removal of local secondary disorders in the middle stage of fever is very generally an important object of the treatment; and it is often rendered peculiarly so by the concurrence of great typhoid exhaustion, which is in some measure incompatible with

the vigorous employment of local remedies. The local disorders of the middle stage are mostly the same with those of the earlier period. The treatment, too, is upon the whole similar, but modified merely in degree by the more exhausted state of the nervous system and general bodily powers.

Local inflammations are best treated by moderate topical evacuations of blood, chiefly with leeches, and by such speedy counter-irritants as mustard cataplasms or blisters. It is surprising how much the ordinary local inflammations of the continued fever of this country are under the control of moderate topical depletion in the middle stage of the disease. So much is this the case, that the theoretical question, whether general blood-letting is admissible for the same purpose in that stage, is one which seldom occurs in actual practice. Blisters are peculiarly serviceable in inflammatory affections of the throat and chest.

Of all local disorders in the middle stage, those which are of most consequence in the fevers of Britain, are clearly affections of the head; because they are the immediate cause of a very great proportion of the mortality from fever. These affections, it was formerly seen, sometimes present the inflammatory character, but much more frequently the characters of cerebral congestion merely. Where the symptoms are such as are commonly thought to indicate an inflammatory tendency, that is, where the face is flushed, the head hot, the temporal stronger than the radial pulse, the delirium active and noisy, and the patient restless, unable to sleep, or inclined to roam about, the most appropriate treatment consists of leeches occasionally to the temples, evaporating cloths, the ice-bag, and the cold douche of the head, together with occasional cathartics. No remedy equals the cold douche, in such circumstances, for subduing restlessness and active delirium. Where, on the other hand, cerebral congestion is the nature of the local disease, as indicated by a feeble though often jarring pulse, great prostration and stupor tending to coma, a dingy complexion, dark injection of the conjunctivæ, subsultus of the tendons at the wrist, and the like, little advantage is derived from cold applications, which are so useful in more active affections. But local depletion by leeches is often serviceable; and more frequently marked benefit is obtained from blisters applied over the whole head. With these remedies ought to be united occasional laxatives where the bowels are constipated, or still better, perhaps, purgative clysters, especially if the debility be very great; also warm fomentations of the limbs, mustard cataplasms to the calves, or other means of exciting gentle counter-irritation of the extremities. With the local treatment it is generally necessary to unite the use of wine, for maintaining the strength and counteracting typhoid exhaustion. This general measure is by no means incompatible with the use

of local evacuants and counter-irritants, as might appear on a hasty view of their respective actions. In point of fact, marked and speedy advantage is often obtained in the worst forms of cerebral congestion by the combination of wine for its general, with blistering of the head for its local, effects. Blisters ought not, in such circumstances, to be applied to the nape of the neck, as is the practice of many, unless where no other space is left; for, at the very least, great torture is occasioned to the patient during the weak, irritable condition of convalescence, and frequently vesication is followed by exhausting suppuration, sometimes by dangerous sloughing. The practice of others of applying blisters between the shoulders, in such circumstances, is still more to be avoided. Superficial suppuration is then almost inevitable, and fatal sloughing not uncommon.

Secondary affections of the chest, when inflammatory in nature and not of prior existence to the fever, are in general easily removed in the middle stage by local depletion, sinapisms, or blisters. The affection of the bronchial membrane, which was described formerly among secondary disorders, under the title of congestive catarrh, is best treated by blisters united with the proper general treatment of the typhoid exhaustion, in which state alone it is ever observed to become considerable.

Of local disorders of the abdomen the most material is entero-mesenteric inflammation, which generally first shows itself in this stage. Its treatment has been already described under the treatment of secondary diseases in the early stage.

Among diseases of the skin, the most frequent requiring attention is excoriation from pressure, tending to gangrene and sloughing; and one of the most dangerous, though fortunately not of common occurrence, is erysipelas. In the middle stage of fever, especially towards the close of the second week, the sacrum is so apt to become erythematous from pressure, that it ought always to be examined at this period twice a day. At first it may be mitigated for some days by altering the pressure with pillows, and by frequent anointing the parts, either with a liniment of equal parts of white of egg and rectified spirit agitated together, or with a lotion of equal parts of opium and acetate of lead in one hundred parts of water; and many sore backs may in this way be saved, by simply delaying the progress of the erythema for a day or two, till the crisis which is approaching shall be formed. But these remedies are only palliative if the fever continue long; and sloughing in that case almost invariably follows. When gangrene has formed, the best remedy is the turpentine liniment, covered with a poultice. Erysipelas may sometimes be successfully treated by small nauseating doses of tartar emetic, especially if administered early in the attack. Other remedies for this disease in its idopathic form are

seldom of service; and indeed it is on the whole an intractable disease in fever. Phlegmasia dolens is best treated by free local evacuation of blood, and warm fomentations; and if suppuration take place, by graduated pressure.

A few special symptoms in the middle stage require attention. Sleeplessness is often grievously complained of by those patients who do not fall into a state of torpor, or into the opposite condition of riotous delirium. Sometimes their complaint is imaginary; but where real, advantage is often found in meeting it by the administration of opiates. Opiates are chiefly useful in two states—when there is sleeplessness without delirium or tendency to stupor, and when there is restless delirium in concurrence with a soft pulse, and the general signs of exhaustion. In either case the criterions which are favourable to their employment are a pulse compressible and not jarring, no great flushing of the face, freedom of the conjunctivæ from particular injection of vessels, and a soft tongue, neither much loaded, nor very dry and brown. In most circumstances where opiates are serviceable they disagree if too often repeated. The best signs of their administration having been judicious are quiet sleep with refreshment on awaking, and a moister state of the tongue. If they produce more delirium, or no refreshment, notwithstanding that sleep was their immediate effect, or if the tongue become more dry and brown, they should be abandoned.

A symptom not uncommon in the middle stage, especially in cases occurring among young adults of the better ranks, is an excessive disposition to leave the bed and roam about. This tendency should never be controlled by too violent measures. If it cannot be prevented by gentle resistance, it is often effectually put an end to by occasional indulgence. The straight waistcoat, which many heedlessly resort to, should be reserved for those cases only where the tendency is accompanied by violence or furiosity, and must be combined with the cold douche of the head. The patient ought never to be left alone, when there is this tendency to quit his bed. Syncope may be induced by efforts to accomplish what is beyond his strength; or fatal accidents may arise from his reaching an open window or a stair-case. So many attempts, some of them unhappily successful, have been made of late by young people in fever in Edinburgh to leap their windows, that this form of delirium is probably either communicated by example, or suggested by the precautions seen to be taken against the danger.

A very inconvenient and common symptom in the middle stage of typhoid fever is tympanitic distension of the abdomen. In severe cases, it is scarcely possible to remove it until a crisis take place, and then it promptly disappears without any remedies. The most useful treatment consists in the occasional administration of

stimulant and carminative clysters. Purgatives by the mouth often increase it, unless where the bowels have been neglected in a state of constipation. Another very inconvenient symptom is distension of the hypogastrium from retained urine. This affection is so common in the middle and final stages of bad cases of typhus, that the practitioner should always make inquiries into the state of the urinary secretion, or daily examine the region of the bladder. It may be removed sometimes by stimulant clysters; but the catheter often becomes necessary.

Of the Final Stage.—By the final stage is here understood the short period, commonly of two or three days at farthest, which usually precedes a fatal event or a favourable crisis, and also that which constitutes the period of crisis. A distinct head has been made of this interval; because when it has fairly arrived, the time for every sort of treatment is generally past, except what consists in supporting the patient against primary and secondary exhaustion. There is good sense in the quaint indication laid down for the treatment in the final stage of fever by authors at the close of the last century—namely, to counteract the tendency to death. When the disease has reached thus far, it seldom continues long; it has a natural limit in the generality of cases; and if the patient can be kept alive for a few days—for example, beyond the seventeenth day, he will for the most part recover, where no serious secondary disorder threatens life. During this important period little is called for in a great proportion of cases, except the faithful administration of the stimulants which have previously been found of service; and when an improvement occurs, it is commonly right to abandon opium, if it had been previously given as a calmative and hypnotic; to countermand counter-irritants or local evacuants; to be on the watch for the period when general stimulants should be reduced; and to offer small quantities of simple articles of food. Laxatives should also be given sparingly, and clysters commonly administered in preference. Much attention must be paid to erythematous parts, and those which were injured by the employment of counter-irritants. Careful inquiry must always be made into the state of the urine, lest retention secretly accumulate to a dangerous degree.

Of Convalescence.—The management of convalescence from fever is directed chiefly to two objects, the restoration of the strength, and the prevention of relapse.

For the attainment of the former object, it is necessary to continue the use of stimulants, and gradually to enlarge the allowance of food. In the generality of cases the quantity of stimulants must be reduced when convalescence is fairly established. They can seldom be dispensed with altogether; but the large and

frequent doses administered advantageously throughout the earlier periods of fever are often observed at this time to cause marked reaction and even a return of the febrile symptoms, more especially frequent jarring pulse, dry, brown tongue, flushing of the face, and disturbed sleep. In some instances, however, convalescence is attended with an extraordinary tendency to fainting in concurrence with constant general depression; and here not only must stimulants be employed largely, but likewise they must be continued very frequently, and with great regularity, otherwise the patient may perish in a state of deliquium. As to food, at first simple farinaceous articles and in the pulpy form are alone admissible; afterwards more substantial articles of the like kind, but without fatty or aromatic seasonings, are allowable; weak soups come next into requisition, and then eggs, or white fish with some simple sauce. Here the physician may pause for a time, before allowing solid animal food. When this is to be allowed, the broiled or roasted flesh of adult animals ought to be given in preference to chicken, veal, or lamb, which many absurdly prescribe at first under the notion that they are more digestible. To the generality they are quite the reverse. In respect of the precise time for these changes, and their exact amount, special circumstances in each case must invariably be the criterions. But the following rules should be constantly kept in view:—that the appetite shall always precede the supply by a day or two; that much excitement after meals shall involve a diminution of allowances; that in the case of the young, the meals shall be more frequent and more scanty than in adults; and that a foul tongue or disturbed sleep is a sign of too abundant a supply.

Some convalescents sleep almost constantly for some time. This is particularly observed of children. Many adults, on the contrary, are much harassed by night-watching, do not sleep above three hours in all daily, and have their slumber in short, broken snatches, which render the night extremely burdensome. Where exhaustion is thus occasioned, opiates are highly proper. But more commonly the patient is well refreshed with what sleep he does get, or is at once renovated by breakfast. In that case opiates are hurtful, and he must be content to watch till exercise restores natural sleep; which will speedily happen when he is able to go out of doors.

The most effectual preventive against relapse is the cautious regulation of the diet in the manner already directed. For the most frequent cause of relapse is some error in diet, particularly premature abundance of food; and the usual manner in which the relapse is established is by the *febricula* which follows digestion being prolonged into confirmed pyrexia. Premature exposure to atmospheric vicissitudes, or inconsiderate fatigue, may have the same effect, and should, therefore, be guarded against. Exposure to atmospheric vicissitudes, however, is more apt to occasion acute

local inflammations than relapse; and of the affections thus induced, neuralgic rheumatism, pneumonia, catarrh, and peritonitis are the most frequent. It is singular that convalescents from fever often retain for some time the same insensibility to cold which characterizes for the most part the state of fever itself. Some, on the contrary, are unusually alive to the impressions of cold, and these ought to be carefully protected against it. But many undoubtedly show for a time a power of enduring cold, which is very surprising, and which protects them against the risk of local inflammations as well as of relapse. All convalescents from fever are apt to suffer most from cold during the night; and it is at this time that local inflammations, especially rheumatism, are most commonly excited.

IX. PROPHYLAXIS OF CONTINUED FEVER.

As it has been shown, in a previous part of these remarks, to be not improbable, that the infection of fever is not active or malignant in the generality of cases, it follows that much may be done by preventive means to lessen its dissemination. Independently of all theory in the matter, the extreme rarity of its propagation in the families of the middle ranks, where no doubt can exist of its having been introduced by infection, contrasted with the certainty of its diffusion in the families of the poor, or in fever hospitals, furnishes ample evidence how much may be accomplished by a skilful prophylactic system.

The principal rules to be observed are the following:—The sick ought to occupy a spacious apartment, capable of being easily ventilated. In hospitals, fever wards ought to be far more spacious than they usually are in this country; and they should have not less than twice the cubic contents of general wards. With the condition of free ventilation secured, complete separation in a family is not absolutely essential; all unnecessary intercourse with the sick should, however, be of course avoided; and in the case of the lower orders, where space and ventilation can scarcely ever be attained, intercourse should be strictly limited to the personal attendance required for the patient's wants. The bed-clothes should be frequently changed; and all unnecessary curtains and hangings removed from the apartment. Fumigations, once in universal use, are now generally abandoned; but unjustly, for they cannot fail to prove beneficial, either by their direct power of destroying animal effluvia, or by necessitating subsequent ventilation; and hence, in the houses of the poor, at least, they should be practised once a-day if possible. Chlorine or nitric acid is most easily borne, and most readily obtained; the former from milk of chloride of lime and sulphuric acid, the latter from

nitre and sulphuric acid, aided in their chemical action by moderate heat. The personal attendants of the sick ought not to be young people; for it has been seen above that the chance of the disease being communicated, is, after thirty years of age, one-half what it is at twenty, and only one-third at forty. It is, of course, desirable to have attendants who are in some measure fortified by having had fever; but this security is seldom attainable. All unnecessary approach to the close vicinity of the sick should be avoided, and where a very close approach is inevitable, more especially when the bed-clothes are raised, the concentrated effluvia from the body should be avoided for a few seconds, or the respiration suspended for a little, so that the emanations just let loose may become somewhat disseminated. Frequent change of the attendants is desirable; and all excessive fatigues, particularly in night watching, must be shunned. The diet of the attendants should be good, and long fasts carefully guarded against. Advantage is probably derived, especially in the case of medical pupils, from vigorous exercise in the open air immediately after any unusual exposure to infection.

[CHAPTER III.

TYPHOID FEVER.

Syn.—See Syn. for Synochus, (p. 77.)

The Continued Fever of the Middle and Northern States of this country is identical with that of the temperate latitudes of the continent of Europe—France, Germany, Sweden, &c.—and is frequently met with in Great Britain. The first attempt to prove the identity of the two diseases was made by Dr. Hale, of Boston, in December, 1833.* Dr. Gerhard, of Philadelphia, indicated the points of resemblance, with greater precision, in February, 1835,† and Dr. Bartlett in June of the same year.‡ In June, 1838, Dr. James Jackson, of Boston, presented an elaborate memoir to the Massachusetts Medical Society, in which he asserted that "the symptoms were essentially the same, and the appearances after death precisely the same." A comparison of the description of the *Typhous Fever* of New England, by Dr. Nathan Smith,§—who, after a practice of twenty-five years in that region, declared that it was the only form of continued fever he had ever met with—and the *Typhoid Fever* of Paris, by Chomel, will satisfy any one of the symptomatology of the two affections being precisely alike.

This disease is known under a variety of names. It is called *long fever, nervous fever, slow fever, putrid fever;* in New England it is usually termed typhus, or typhous fever. In accordance with Chomel, Gerhard, J. Jackson, and Bartlett, we prefer Typhoid Fever, as the appellation least liable to objection.

I. DEFINITION.

Typhoid Fever is an acute affection, whose anatomical character is an enlargement and special alteration of the intestinal follicles, accompanied by increase of volume, injection, softening, and occasionally suppuration of the corresponding mesenteric glands. The usual symptoms are, continuous fever, of variable

* [Medical Magazine, December, 1833, Boston.]
† [Am. Journ. of the Med. Sciences, Feb., 1835, Philadelphia.]
‡ [Medical Magazine, June, 1835, Boston.]
§ [Essay on Typhous Fever, New York, 1824.]

intensity: stupor; prostration; pain and gurgling, on pressure, in the right iliac region; an eruption, generally observed on the abdomen and lower part of the thorax, of lenticular rose-coloured, slightly elevated papulæ, disappearing on pressure; meteorism; diarrhœa; pulverulence, or brownish coating of the interior of the nostrils.

II. ANATOMICAL CHARACTERS.

The constant lesions found in persons dying of typhoid fever are in the follicles of the small intestines, and mesenteric glands. The follicular alterations vary with the period of the disease. On examining the exterior of the small intestines of those who have died from the fifth to the eighth day, reddish, blue, or black opaque discolorations, sometimes covered with false membranes, and corresponding in situation to the diseased follicles, are visible along the curvature. On pressing these spots between the fingers, they are found to be hard and unequal. On opening the intestine by an incision along the mesentery, the *agminate follicles* (glands of Peyer) will be discovered in one or both of the following morbid conditions.

1. *Soft patches:*—slight prominence; the mucous membrane a little softened, and the surface smooth, or mammillated. On cutting into the elevated patch, the mucous and subcellular tissues are moist, injected, and thickened. In some instances the gland has a reticulated appearance, the tissue resembling the parenchyma of the cherry or plumb, the mucous membrane being softened and readily detached.

2. *Hard patches:*—more elevated than the preceding variety; elastic to the touch; on division the submucous tissue appears to be transformed into a homogeneous matter of a pale yellowish hue, firm and friable. The surface is plane and shining. This species occurs in about one-third of all the cases; usually in those which terminate at an early period; and is supposed to be connected with the more severe and rapid forms of the disorder.

3. *Ulcerated patches*—are observed after the ninth or twelfth day; there are two varieties: in one the ulceration begins in the mucous membrane, and extends to the gland, which it gradually destroys; in the other the yellow matter of the gland first softens, the mucous membrane being consecutively involved, and easily detachable in shreds. Sometimes the transformation is so rapid, that the mucous membrane escapes, or is only partially implicated. The ulcers are commonly oval or elliptical; in some the edges are hard, thick and salient; in others they are thin, the mucous membrane being undermined throughout the circumference. The base of the ulcer is brownish or slate colour; granular or smooth;

or it may be formed by the muscular coat, somewhat hypertrophied; or by the peritoneum. Sometimes the peritoneum is perforated by the extension of the ulceration, or from the formation and subsequent separation of an eschar; these perforations are about a line or two in diameter, are single or multiple, are found in the lower part of the small intestines, and when the altered patches are but few. The number of diseased patches varies from one to thirty or forty; they bear no proportion, either in number or degree of alteration, to the symptoms during life. Usually, most or all of the alterations just described are found in the same subject. The patches nearest the ileo-cæcal valve are those most compromised. The transition from a diseased to a healthy state is generally abrupt, a healthy patch being rarely found between two diseased ones. Resolution takes place in the non-ulcerated patches, except in the reticulated variety of the soft patch, in which there has been loss of substance. In the ulcerated glands there is a gradual reparation of the lost substance; the borders of the ulcer become effaced, whilst its base is covered by a thin, smooth, non-villous pellicle, of a serous aspect, which at the end of several months undergoes mucous transformation.*

* [Vogel has given the following description of the elevated patches previous to ulceration. "When portions of this mucous membrane were examined beneath the microscope, the capillary vessels were observed filled with blood, which appeared as a red perfectly homogeneous fluid, none of the individual corpuscles being distinguishable; it was still fluid, however, and could be squeezed out of the vessels by slight pressure, whereupon the unaltered individual corpuscles became apparent. The vessels were from 1-100th to 1-200th of a line in diameter; the mucous membrane, within which they ran, was colourless, and presented a coarsely granular aspect. The epithelium was desquamated, but the cylindrical cells were found, both singly and arranged in groups, immersed in the surrounding mucous fluid. The mucous membrane and intestinal villi were in places tinged of a brownish-yellow colour by bile. Neither the membrane nor villi were much acted on by acetic acid; a few nuclei, about 1-400th of a line in diameter, and provided with nucleoli, being here and there brought into view by this reagent. When portions from the middle of the patches, about half a line below the mucous membrane, were examined beneath the microscope, they were observed to be traversed by blood-vessels from 1-100th to 1-80th of a line in diameter; these vessels were filled with blood, which was still in a fluid state, and its corpuscles unaltered. These portions themselves were composed almost entirely of a granulo-amorphous substance, between which were observed a few fibres of a fibro-cellular tissue, either separate or woven together into bundles. On treatment with acetic acid, a number of cell-nuclei came into view. Immediately beneath the patches was a layer of whitish cellular tissue [the lowest stratum of the submucous tissue], which, under the microscope, presented the ordinary appearance of fibro-cellular tissue. Almost all these fibres disappeared on treatment with acetic acid; a few only remained, and these became more distinct (nucleus-fibres?) Next beneath this layer of cellular tissue came the muscular coat of the intestine, there being no foreign substance between; the individual fibres of this coat were flat, and about 1-500th of a line in diameter; they were rendered pale by acetic acid, whereupon their elongated nuclei came into view. Outside this coat was the peritoneal covering; its blood-vessels were very large, and visible to the naked eye, most of them being rectilinear, and running parallel to the axis of the intestines. This peri-

The *isolated follicles* (glands of Brunner) frequently present the same alterations as the *agminate;* when affected they appear as conical, rounded elevations, about the size of hempseed, and resemble large pustules. This condition is found only in the lower half of the ilium.

The *mucous membrane* between the follicles is, in about four-fifths of the cases, more or less softened and injected. In those dying after the 20th day, a simple gray or slaty discoloration is seen only.

The *mesenteric glands* are as constantly affected as the intestinal follicles. Their condition varies with the epoch of the disorder. From the fifth to the thirteenth day they are merely enlarged, softened, and friable, and in hue from a delicate rose to a deep red. From the fifteenth to the twentieth this alteration is still more marked, and yellow points of suppuration are not unfrequently found disseminated through their tissue, but pus is rarely or never collected in an abscess. From the 20th to the 30th day they diminish in size and assume a violet or brownish colour; after the 30th day they become gray, or slaty in hue, and more consistent. The degree of alteration seems to be in proportion to that of the intestinal follicles; those glands nearest the cæcum are the most affected.*

toneal coat, when stripped off and examined beneath the microscope, was found to be composed of fibro-cellular tissue, the bundles of which ran in a direction parallel to that of the axis of the intestines. Between these fasciculi were observed blood-vessels, and numerous elongated caudate cells. The diseased thickening, therefore, was confined to the mucous membrane and the immediately adjacent submucous tissue, and seemed to be the result of the deposition of a granulo-amorphous material within the healthy tissue of these parts."*a*]

* [Most of the German pathologists—Rokitansky, Engel, Vogel, &c.—maintain that in the course of typhoid fever a peculiar morbid matter is deposited in certain tissues and organs—particularly the mucous membranes, intestinal follicles, and mesenteric glands. They call it the "typhous material," and from the second to the eighth day is the period within which it begins to be deposited. It may be either in a fluid or solid form. Engel says the "fluid matter is a viscid opaque greenish-brown material, which, when allowed to remain at rest for some time, deposits an abundant sediment of epithelial cells, crystals of ammonia-phosphate of magnesia, and brownish flocculent coagula, whilst the fluid itself remains of a brownish or reddish colour, and contains a considerable quantity of albumen: it undergoes no other change but that of decomposition. The solid portion of the typhous product appears in the solitary and Peyerian glands of the small intestines, in the follicles of the large intestines, and in the mesenteric glands; it assumes the forms of these various parts in which it occurs, has a soft pulpy consistence, a grayish-red colour, and appears shortly after its deposition as a finely granular substance, mixed with blood-corpuscles, and seems to be chiefly composed of albumen."*b* Examined beneath the microscope, Vogel found this substance appearing "as an amorphous, slightly granular mass, of a brownish-white colour, within which a large quantity of small-sized cells were deposited. These cells had an irregular roundish form; the majority were below

a [Erläuterungstafeln zur Pathologischen Histolgie. Translated by W. S. Kirkes, Lond. Med. Gaz., vol. xxxvi., p. 1137.]

b [Schmidt's Jahrbücher, No. 7, 1845. Lond. Med. Gaz., loc. cit.]

The alteration in the agminate and isolated follicles of the small intestines is so constant in typhoid fever, that it may properly be called its anatomical character, or organic characteristic. It is, nevertheless, true, that in scarlatina, cholera, and phthisis the intestinal follicles, particularly Peyer's glands, undergo changes of structure, but which are not analogous to that observed in continued fever. In scarlatina, Peyer's glands are *said* to be occasionally enlarged; but they never contain any yellow deposit, or ulcerate; nor are the mesenteric glands implicated. In cholera they are frequently elevated, but much less so than in typhoid fever, and no further change occurs. The resemblance between the diseased follicles in phthisis and in continued fever is much greater. Instead, however, of a uniform layer of whitish deposit, the patches present on their surface a number of small elevations, like isolated tubercular follicles; in some cases a few only have ulcerated, in others there are extensive ulcerations, with a few of these tubercles on the edges. Where there are extensive ulcerations only, the induration and thickening of all the surrounding tissues distinguish their nature. Tubercular matter, too, is found in the mesenteric glands.

III. SECONDARY LESIONS.

The spleen is morbidly altered in most cases. It is ordinarily enlarged and softened, sometimes attaining four or five times its natural size. The mesocolic glands are occasionally in the same pathological condition as the mesenteric glands. Ulcerations of the mucous membrane of the pharynx and œsophagus are met with in a certain number of instances. The mucous membrane of the stomach is in many cases softened and thinned, and sometimes ulcerated. The large intestine is diseased in a large majority of cases; there is softening of the mucous membrane of the cæcum and colon, with or without injection and thickening; hard, elevated patches, similar in character to those in the ileum, but smaller and not friable, are now and then met with; ulcerations, independent of the follicles, exist often in the colon; they vary in diameter from 4 to 30 lines. The heart is softened in about one-half of the cases. These are the only lesions which occur with any frequency or constancy in typhoid fever, or appear to have any intimate relation to the phenomena of the disease.

1-300th of a line in diameter; a few measuring from 1-150th to 1-200th of a line; some were distinctly nucleated. By treatment with acetic acid, the amorphous substance became transparent, and gradually disappeared, upon which very small cells (cell-nuclei?) with sharp outlines came distinctly into view, being unaffected by the acid. Both cells and blastema were dissolved by ammonia, and by caustic potash. The glands of the colon contained a substance exactly similar to that found in the mesenteric glands, and in those of the small intestines."]

IV. SYMPTOMS.

Typhoid Fever varies in its mode of attack. The invasion is sometimes sudden and distinctly marked, occurring unexpectedly in the midst of health; more frequently, it is gradual and insidious, some deficiency of bodily and mental vigour, general uneasiness, and discomfort, pain and feebleness in the limbs, dizziness, disturbed sleep, loss of appetite, foul tongue, and even nausea being felt for several days—sometimes a week, or even longer.

Accession often begins with intense frontal headache, on waking in the morning; though sometimes there is only a sense of heaviness with vertigo; a shivering fit, of variable intensity, soon follows, and is succeeded by increased heat of skin and frequency of pulse. A rapid and striking change in the physiognomy now takes place; the expression is besotted; the face is flushed; the hearing is dull, with ringing in the ears; the intelligence is weakened; and there is sensible muscular debility, shown by the staggering walk. Diarrhœa is often an early and prominent symptom, setting in with the fever, though obstinate constipation may exist. Epistaxis frequently takes place in the early days of the disease; it is usually slight and recurrent, though sometimes excessive; when trifling, and the patient is in bed, the blood escapes into the pharynx, and is rejected mixed with mucus as round and dark sputa.

The disorder being now established, headache, if previously absent, is felt. There is considerable disturbance of the sanguiferous system, the pulse being large, resisting, and over 100. After two or three days it becomes softer, and quicker; in young persons, females, and adult males of irritable constitutions, it often reaches or exceeds 120. The skin is dry, and pungently hot; thirst is urgent and constant; the secretions of the mouth are thick and glutinous; the tongue, which was furred, becomes dry and clammy; or, coated at the base and in the centre, the edges being red. As the mouth dries the whole mucous membrane acquires a uniform red colour; the lips crack, and the teeth look brilliant from the dried layer of mucus which covers them. Anorexia is complete; and there is often nausea, with vomiting of bitter and greenish matters. The diarrhœa is persistent, four or five thin yellow evacuations taking place daily, attended with pains in the bowels; the abdomen is distended and tympanitic; there is pain on pressure, around the umbilicus, and pain and gurgling on pressure in the right iliac region. The spleen is generally enlarged, shown by increased dullness on percussion in the left hypochondrium; it sometimes extends below the margin of the ribs. Slight cough generally exists from the outset, with the ex-

pectoration of viscid, greenish sputa, and quickened respiration. Sonorous and sibilant rhonchi are found, unequally diffused through both sides of the chest, although more marked inferiorly and posteriorly. We have seen extensive double bronchitis in this disorder without a single objective symptom and only discoverable by physical exploration.*

From the 5th to the 9th day the peculiar *typhoid eruption* appears. It consists in minute rose-red spots, disappearing on pressure, from half a line to two lines in diameter, of a circular form and slightly raised above the level of the skin; generally found on the abdomen, and lower part of the chest, they are sometimes met with on the back, arms, and thighs. The eruption does not make its appearance on all the points at once; nor is its duration always the same; in some cases it disappears entirely after two or three days; at other times it persists during twelve or fifteen; in the latter case it consists of several successive crops, as each rose spot is visible for three or four days only, and sometimes less. Before fading, it generally becomes darker in its hue.

The symptoms of the nervous centres now increase; the muscular debility is excessive; the patient lies motionless on his back,† or there is a tendency to slide down in the bed; he seems perfectly indifferent to his situation; his features are immovable; he desires to be let alone; questions, when heard and understood, are slowly and reluctantly answered, and often with evident ill-humour,—the replies being brief and dry; the perception of surrounding objects is vague; women make slight or no efforts to resist exposure of their persons; the eyes are injected and brilliant, but have an expression of unusual stupidity; sleep is unrefreshing, and disturbed by vivid and startling dreams. The headache diminishes, or ceases entirely about this period. The face is swollen, and the cheeks of a lurid red. The pulse is soft, rapid, and often irregular; and diminution in the intensity and duration of the first sound of the heart, with sometimes its total extinction, is met with in many cases. This phenomenon, first mentioned by Dr. Stokes, of Dublin,‡ has since been observed by Dr. Pennock, of Philadelphia,§ Huss, of Stockholm,‖ and the writer. There is complete deafness; with irregular and involuntary movements of the tendons of the arms and hands; convulsive twitches of the nose and upper lip; carphology; and great wakefulness. Delirium generally occurs during the second week, and is first manifested at night, the usual period of febrile exacerbation; it is peculiar,

* [Medical Examiner, vol. vi., p. 294.]

† ["*Il gît, mais il ne couche pas.*" Quelques Reflections sur la Fièvre Typhoide, par le Docteur Sandras.—Gaz. Méd., 1845.]

‡ [Dublin Med. Journ., March, 1839.]

§ [Med. Examiner, vol. vi., p. 123.]

‖ [Gazette Médicale—Nos. 15 to 16 inclusive—1845.]

usually tranquil, and rambling; though sometimes it is violent, with a disposition to talk loudly, leave the bed, and roam about. Sometimes the patient, at this period, falls into a drowsy state—the coma somolentum of authors—from which he cannot be roused except for a few moments. There is now an aggravation of all the general symptoms; the tongue becomes dryer, browner, fissured, and trembling; sometimes it is of a bright red colour and smooth, as if covered with a coat of varnish. The mouth and teeth are crusted with dark sordes; there is great difficulty, or even inability, to swallow or protrude the tongue; this may arise from paralysis of the muscles of deglutition, but often the half-dried mucosities collect around the base of the tongue and render the attempt painful or impossible. The nostrils become obstructed by dried mucus or blood, and the breathing has a peculiar whistling sound. The pulse is quick and irregular; diarrhœa is abundant, and the stools are often passed involuntarily; there is retention of urine; and hemorrhages may occur from the nose, bowels or uterus. Concurrently with these symptoms, petechiæ are sometimes observed. A peculiar odour is exhaled from the body, by some said to resemble that from mice.* The heat of the body is acrid. Sloughs are apt to form, for in no acute disease is ulceration of the integuments more common than in this. They occur in about one-fifth of the cases; and are generally found on those parts of the body exposed to pressure—as the sacrum, occiput, heels, trochanters, &c.; or, gangrene may attack blistered surfaces, or leech bites, or those portions of the skin where sinapisms have been applied. Sometimes spontaneous sphacelation takes place. Dr. Grisolle has seen gangrene of the integuments of the thigh, scrotum, foot, and lower lip supervene in the course of typhoid fever, without any appreciable cause. Dr. Roupell relates an instance of the entire soft parts of both legs becoming gangrenous, so as to render necessary the removal of the bones by the saw. Besides the lenticular rose-spots, or *typhoid eruption*, and petechiæ, small demi-hemispherical, transparent vesicles are sometimes observed in the course of the

* [Dr. Richter, of Dusseldorf, relates a case in which *ammonia was excreted by the skin*. Three days before death, when the patient was comatose, the face, hair of the head, and beard became covered with a whitish shining matter resembling spermaceti. On examination, the face was found sprinkled with minute spots of a whitish substance, which on being removed, left the skin with a punctated appearance. The excretion continued until death, after which the thighs were found covered with small needle-like crystals. Chemical analysis proved that the excreted matter was alkaline and ammoniacal, and contained, in addition, a whitish yellow substance soluble in ether.*a* Liebig has found ammonia in the air of the vicinity of fever-patients; and Donne and Prout ascertained that the rhomboidal prisms in the urine and feces, consist of the phosphate of ammonia and magnesia.]

a. Oesterreich. Med. Wochens. 1843, p. 437. Bennett's Report on the Progress of Pathology, &c. B. & F. M. Rev., vol. xx., 1845.

second week. When viewed obliquely they have a brilliant appearance, but when looked at perpendicularly to their axis, escape notice. They are readily distinguished by the touch; they appear at first on the sides of the neck, and in the folds of the arm-pit and groin, from thence in some cases extending to the trunk and limbs. Though not so intimately connected with the disease as the rose spots, they are much more frequent in it than in any other with which it might be confounded.

Towards the close of the second week, or beginning of the third, a decided change or "turn" takes place. If the attack is to terminate in recovery, the symptoms abate; the expression of the face is more natural; the pulse slower and steadier: the patient takes notice of what is passing around; the skin becomes moist, soft, and of natural temperature; and the tongue cleans rapidly. Some critical evacuation, as sweating, not unfrequently precedes this amelioration. If, however, the disorder is to prove mortal, there is a decided increase in severity of the symptoms, or new ones supervene.

Typhoid Fever may terminate fatally in four different ways. Drs. Alison and Williams have both particularly insisted on the importance of studying the modes of death in continued fever, from its direct practical bearing; for by anticipating the kind of fatal termination most probable in each case, we may be guided to a rational and successful treatment.

1. *Necræmia*, or *death beginning with the blood*, is the most usual fatal termination of Continued Fever. The symptoms called typhoid, and lately described, belong especially to this class of death; the heart loses its power, the pulse becoming fearfully rapid, weak, and unsteady; the whole surface has a congestive appearance, the hue being dusky or livid; the brain becomes inactive, as the direct result of the noxious poison circulating in the blood, and stupor ensues; the medulla is torpid, and respiration and excretion are imperfect; there is intense prostration of strength; half closed eyes and dilated pupils; molecular nutrition ceases; and *molecular* death follows closely on *somatic* death, or may even precede it, as exhibited in the sloughy ill-conditioned ulcers, and putrid odours.*

2. Death by *Coma* resembles that by *Necræmia* and is often confounded with it. It results from *mechanical pressure* on the brain, from effused lymph, or serum. Death by coma begins at the brain, the symptoms being those of interrupted function of the cerebrum, insensibility and suspension of voluntary motion. Stupor comes on gradually and deepens; symptoms of impaired excito-motory function appear; the breathing is stertorous, and imperfect; deglutition becomes impossible; the pupils are dilated;

* [Clymer's Edition of Williams' Principles of Medicine, p. 373.]

and the sphincters are relaxed, involuntary discharges of urine and feces taking place.

3. Death from *apnœa*, or *death beginning at the breathing apparatus*, is partly due to the enfeebled state of the circulation, and want of power in the heart to propel the blood through the lungs; but partly, also, to the congested state of those organs from bronchitis or pneumonia. It is rarer than that by necræmia or coma, but is not unfrequent, and is often mingled with coma. The phenomena are those of asphyxia.

4. The mode of death by *Asthenia* or syncope, is not common by itself, though sometimes, when the disease is of long continuance, death does apparently take place from mere cardiac debility. It happens in those who have been subjected to a debilitating treatment, and who have not been properly nourished during the disease.

State of the Blood.—The condition of the blood in typhoid fever has been studied with a good deal of care within a few years. Andral, Bouillaud, Forget, Simon, and a number of others have published the results of these investigations. "The blood in typhoid fever," the late Dr. Franz Simon remarks,* "exhibits the characters of hypinosis perhaps more distinctly than in any other affection: but the statements regarding its qualitative and quantitative composition are still very contradictory, arising, probably, in part, from its varying in the different stages: thus, in the period of excitement, it may incline towards a state of hyperinosis; in the stage of depression, the fibrin gradually decreases; and lastly, in the stage of collapse, the quantity of blood-corpuscles and of solid constituents decreases so remarkably, that in the case of putrid typhoid fever the blood (in consequence of the liquor sanguinis being too watery, and deficient in salts), assumes the state of spanæmia. The same appears to occur in petechial typhus. One source of difference is therefore evidently dependent upon the stage of the disease at which the blood is taken: the presence of any inflammatory symptoms will also modify its constitution.

"The blood in typhoid fever is found to be very deficient in fibrin, and frequently also in albumen: it coagulates imperfectly, and often remains in a semi-fluid state: the clot is soft, friable, of a very dark, almost black red colour, and is very rarely covered with a buffy coat: this form of blood becomes putrid sooner than the healthy fluid.

"I have made two analyses of the blood in rather mild forms of the disease. The results do not by any means give a good idea of hypinosis sanguinis.

* [The Chemistry of Man: Translated by Thomas E. Day, &c. p. 236. Phil., 1845.]

	Analysis 29.	Analysis 30.
Water - - - -	816·875	792·340
Solid residue - - -	183·125	207·660
Fibrin - - - -	2·525	2·010
Fat - - - -	2·233	2·200
Albumen - - - -	90·650	80·330
Globulin - - - -	75·205	99·510
Hæmatin - - - -	3·985	5·300
Extractive matters and salts - -	9·678	12·670

"The disease diagnosed in both instances (which occurred in our hospital) was dothinenteritis. In both cases venesection was ordered at an early stage of the disease, when there was a good deal of vascular excitement present, which may account for the partial decrease of the fibrin and increase of the corpuscles. The blood in Analysis 29 was taken from a man 30 years of age; the tongue was furred, abdomen tender on pressure, mind tolerably clear; pulse rather full, 95 in the minute. The blood in Analysis 30 was taken from a man 38 years of age; in whom there was a good deal of nervous excitement, giddiness, and buzzing of the ears; the abdomen was tender on being pressed, the tongue thickly coated, and the pulse quick, rather hard and full. Both cases turned out favourably."

In an analysis of the blood in typhus abdominalis, made subsequently to the publication of his Chemistry, Simon found, water 887·5, solid constituents 112·5, fibrin none, albumen 54, hæmatoglobulin 47·25.

The most comprehensive researches on the blood in typhoid fever are those of Andral and Gavarret, who made 50 analyses of blood taken from 20 persons suffering under this affection. The following are their principal results:

The fibrin never rises perceptibly above the normal standard in true typhoid fever. It often remains at the normal height, and is still more frequently below it. In inflammatory disorders it is pretty clear that the fibrin increases with the intensity of the disease; here we observe just the reverse: the fibrin decreases in proportion to the advancement of the disorder. Andral and Gavarret observe that this cannot be ascribed to the repeated bleedings, or to the continual low diet, for these circumstances induce no change in the amount of fibrin in other diseases. As soon, however, as any symptoms of convalescence appear, the fibrin begins to increase, even before the organization could contribute a supply by increased nutriment. This continues to be the case during the progress of convalescence, and as the patient improves the corpuscles simultaneously decrease.

In inflammatory diseases there is a general tendency to diminution in the corpuscles: here we have just the reverse, for the more frequently we analyze blood soon after the outbreak of the

disease, the more frequently shall we find instances in which the corpuscles, instead of being diminished, are considerably increased, and, even in the more advanced stages, the amount of the corpuscles is frequently found to exceed, or at any rate to equal the normal quantity. The absolute increase of the corpuscles is not, however, so decided as the increase of the fibrin in inflammatory diseases; neither is it so essential a condition for the existence of the disease, for even in those cases in which the amount is much increased at the commencement of the disorder, it may become diminished during its course, and even when it is getting more severe. However, when the absolute quantity of the corpuscles is diminished, its proportion to the fibrin is still greater than is ever observed in the normal state.

The leading characteristic of the blood in this disease is the decrease of the fibrin, which diminishes in proportion to the violence of the attack, and from which another character is derived, namely, the increased amount of corpuscles. During the early period the diminution of the fibrin is not absolute; it is only relative in relation to the corpuscles; but as the disease approaches its height, the diminution becomes absolute.

Researches instituted in mild cases may give perfectly negative results. Their maximum of fibrin was 3·7; their minimum ·9 It is true that in one case they found 4·2 of fibrin, but the blood was taken during convalescence. The maxima, minima, and average results of 41 analyses are given in the following table:

	Water.	Solid residue.	Fibrin.	Blood-corpuscles.	Solid residue of serum.
Maximum -	862·3	243·7	4·2	149·6	98·0
Minimum -	756·3	137·7	0·9	66·7	66·8
Average -	796·0	204·0	2·6	116·0	77·9
Healthy blood -	790·0	210·0	3·0	127·0	80·0

This average of 41 analyses (some have been omitted, as giving no definitively clear result), does not give the general characters of the blood, as it is expressed in the majority of the analyses. The amount of fibrin is certainly less than in healthy blood, but the corpuscles do not attain to their normal height. If, however, the fibrin is estimated at 3·0, the proportion of the corpuscles is 134, which is higher than in healthy blood. The quantity of the residue of the serum, and of solid constituents generally, approximates closely to the normal standard. The inorganic constituents of the residue of the serum amount, on an average, to 7·6%, which is very little lower than the corresponding number in erysipelas or rheumatism.

The following table contains the numerical results of Andral and Gavarret's researches on the blood in typhoid fever. In order to make the proportion of the corpuscles to the fibrin more striking, the numbers obtained from the analyses are not merely

given, but the relative numbers on the assumption that the fibrin is constantly represented by 3.

Venesection.		Date of attack.	Water.	Solid constituents.	Fibrin.	Blood-corpuscles.	Blood-corpuscles. (*Fibrin*=3.)	Residue of serum.
1st Case	1	5	756·3	243·7	2·3	145·3	180·0	96·1
	2	7	769·7	230·3	2·1	135·8	193·0	92·4
	3	8	785·2	214·8	1·8	126·2	210·0	86·8
	4	10	798·6	201·4	1·3	116·2	268·0	83·9
	5	15	827·4	272·6	1·0	91·7	273·0	79·9
2d "	1	?	819·7	180·3	0·9	93·1	310·0	86·3
3d "	1	5	752·9	247·1	2·4	146·7	183·0	98·0
4th "	1	7	766·5	233·5	2·5	143·6	172·0	87·4
	2	9	777·6	222·4	3·7	136·2	110·0	82·5
	3	12	782·1	217·9	3·6	134·5	112·0	79·8
5th "	1	8	767·6	232·4	5·0	139·3	83·0	88·1
	2	10	777·3	222·7	5·4	129·7	72·0	87·6
	3	11	782·4	217·6	5·0	127·1	76·0	85·5
	4	14	791·7	208·3	4·0	123·6	92·0	80·7
6th "	1	9	769·5	230·5	3·6	149·6	124·0	77·3
	2	10	784·7	215·3	2·9	125·3	129·0	87·1
	3	12	804·3	195·7	2·3	123·7	161·0	69·7
	4	15	831·1	168·9	1·9	103·0	163·0	64·0
	5	33	845·5	154·5	3·7	79·6	64·0	71·2
7th "	1	9	810·3	189·7	3·4	102·4	90·0	83·9
	2	10	816·2	183·8	3·5	105·0	90·0	79·8
	3	12	825·6	174·4	2·3	93·9	122·0	78·2
	4	17	836·8	163·2	1·7	86·3	152·0	75·2
	5	24	847·8	152·2	2·1	76·0	108·0	74·6

From these two columns of the blood-corpuscles we see that the decrease of the fibrin is almost always connected with the increase of the corpuscles, so that the proportion between the two gradually differs more and more from the normal mixture. The exceptions to this rule are caused either by some inflammatory complication, as in the fifth case, where an acute attack of bronchitis accompanied the fever, or by the patient being in a state of convalescence as in the fifth analyses, in cases 6 and 7. Andral and Gavarret offer no explanation of the peculiarities in the fourth case.

The solid constituents of the blood are more frequently above than below the normal standard, but the proportion is a fluctuating one, and dependent, as we shall presently see, on the progress of the disease.

Lecanu has analyzed the blood of two persons suffering from typhoid fever. As he did not determine the amount of fibrin, the proportion of that constituent to the corpuscles cannot be shown. Their absolute quantity is less than in normal blood. Lecanu also states, that he thinks that a paucity of corpuscles may be inferred from the smallness and friability of the clot, a statement at variance with the researches of Andral and Gavarret.

Lecanu also found a diminution of the solid constituents generally:—

Water - - -	805·20	795·88
Solid residue - -	194·80	204·20
Blood-corpuscles - -	115·00	105 00
Residue of serum - -	79·00	99·12

Chomel does not consider that the diminution of fibrin is a specific character of the blood in typhoid fever, because he found that in 6 out of 30 cases the blood formed a solid clot, covered with a buffy coat, but differing in thickness and colour from the inflammatory clot; while in 2 cases there was a slight film, beneath which the clot was diffluent; in 2 the blood remained perfectly fluid and slightly lumpy, and in 20 the blood formed a firm clot, but no buffy coat. The blood in all these cases was taken during the first or the commencement of the second stage, never in the third. The peculiarities in Chomel's statement may be partly due to the blood being taken at a period before the fever had reached its height, partly to the association of some inflammatory symptom, or to a more synochal type of the disease.

According to Jennings,* the blood in the first stage of typhoid fever (depression) is generally thick and dark; it coagulates rapidly and forms a soft, large, dark-coloured clot. In the second stage (excitement) it flows readily, is of a scarlet colour, does not coagulate so quickly as, and forms a more solid clot than the former. It is also occasionally covered with a slight buffy coat. In the third stage (collapse) it flows very readily, is thin, watery, and of a dark colour: the clot is loose and flocculent, and occasionally appears more as a sediment of colouring matter than as a clot. In thoroughly developed typhus Dr. Armstrong found the blood of the temporal artery as dark as that of the vein. Dr. Clanny also states that the watery portion of the blood increases with the intensity of the disease, and that not merely the solid constituents generally, but also the salts and carbonic acid are diminished. The water begins to decrease, and the solid constituents to increase in favourable cases after 12 or 18 days. According to Stevens, the salts of the blood (especially the chloride of sodium) are diminished in all typhoid fevers.

Becquerel and Rodier have analyzed the blood of 13 persons attacked with typhoid fever, 11 men and 2 women. Of the 11 men, 6 were bled once, 4 twice, and 1 thrice; of the 2 women, 1 was bled once, and 1 thrice.

The following table exhibits the mean composition of the blood of the male patients, obtained at the first venesection:

* [Course of Lectures on the Physiology and Pathology of the Blood, by H. Ancell. The Lancet, 1840, p. 338.]

Density of defibrinated blood	1054·4
Density of serum	1025·4
Water	797·0
Solid residue	203·0
Fibrin	2·8
Fat	1·773
Albumen	64·8
Blood-corpuscles	127·4
Extractive matters and salts	6·3

The salts consisted of:

Chloride of sodium	2·9
Other soluble salts	2·5
Phosphates	0·497
Iron	0·555

The fibrin varied considerably, the maximum being 4·9, while in three cases it was considerably below the normal standard. The albumen and blood-corpuscles were, in most instances, diminished.

Four of the same men were bled a second time, and the following table gives the mean results of the blood obtained in these four cases, on both occasions:

	1st Venesection.	2d Venesection.
Density of defibrinated blood	1054·0	1051·4
Density of serum	1025·0	1024·7
Water	801·0	814·5
Solid constituents	199·0	185·5
Fibrin	2·3	1·3
Fat	1·527	1·408
Albumen	64·4	62·0
Blood-corpuscles	124·5	113·5
Extractive matters and salts	6·0	7·3

The salts consisted of

Chloride of sodium	3·6	3·5
Other soluble salts	2·6	2·7
Phosphates	0·544	0·255
Iron	0·581	0·519

A comparison of the two columns shows that the blood obtained by the second venesection contains a considerably smaller mean amount of fibrin than the blood previously taken. The albumen and corpuscles are likewise diminished.

The case in which venesection was performed three times offered no peculiarity; neither did the analyses of the blood of the two women.

In all these analyses the clot was found to present no striking peculiarity. There was none of the softness and diffluence on which the older writers laid so much stress.

Scherer has analyzed the salts of the blood in a case of typhoid fever. In 1000 parts of blood there were 176·3 of solid residue,

which on incineration yielded 11·92 of fixed salts. These consisted of:

Chloride of sodium	-	6·82
Carbonate of soda	-	1·41
Sulphate of soda	-	0·84
Phosphate of soda	-	0·94
Carbonate of lime	-	0·16
Phosphate of lime	-	0·60
Sulphate of lime	-	0·22
Peroxide of iron	-	0·60*

State of the Urine.—It appears from the observations of Schonlein and Simon that the urine in the regular course of typhoid fever, is at first dark and very acid, subsequently neutral and even alkaline, and again acid at the commencement of convalescence. The following observations are recorded by Simon in his Animal Chemistry. In one case the urine became faintly alkaline on the seventh day after admission; it remained either alkaline or neutral for seven or eight days; and then became faintly acid and gradually clearer, as soon as the patient exhibited symptoms of convalescence.

In a second (very severe) case the urine remained acid till the twenty-first day; it then became neutral, and afterwards alkaline, for the space of ten or eleven days, when it returned to its normal reaction.

In two other cases the urine became alkaline previously to the fourteenth day of the disease; in one of them the secretion was so thoroughly saturated with carbonate of ammonia, and evolved so disgusting an odour, as to be perceptible over the whole ward. This urine deposited a considerable sediment of pus or mucus, mixed with the phosphates of lime and magnesia, and effervesced briskly on the addition of an acid. In one of these cases the urine remained alkaline for fourteen, and in the other, for twenty-one days, before it resumed its acid reaction. Both cases recovered.

It is worthy of notice, that a deposition of urate of ammonia not unfrequently precedes the occurrence of alkalinity and the appearance of the earthy phosphates, which, as Schonlein remarks, may be regarded as the precursors of a favourable change.

II. CONVALESCENCE.

The duration of convalescence is generally proportionate to the gravity of the attack; where this has been severe and protracted, and the prostration extreme, strength is slowly gained,

* [Simon's Animal Chemistry, p. 242. Phil., 1845.]

and amendment is very gradual. Emaciation is often excessive at the commencement of convalescence. Painful œdema of the lower extremities, and loss of the hair of the head are frequent occurrences after typhoid fever. Where the debility is great, the mental faculties are often impaired; and this condition exists until recovery is completed. The hearing, in many instances, remains dull for some time; especially in those cases where there has been purulent discharge from the meatus. If perforation of the membrana tympani has taken place, hearing is rarely restored perfectly. Convalescence is sometimes suddenly arrested by symptoms of gastric distress: the digestion becomes laborious, the skin hot, and the pulse quick; proceeding from some irregularity of diet, they subside, usually, after a day or two. Abscesses, eschars, and erysipelas often render convalescence tedious.

III. VARIETIES.

Typhoid Fever recurs under various forms, according to the presence, or absence, or prominence of certain symptoms. Individual cases and entire epidemics are sometimes so mild, that not a single severe symptom is present from the beginning to the end. The subjective phenomena are so insignificant as often to escape notice. Between the mild and latent forms, every variety of gradation is observed. Sometimes the general symptoms common to inflammatory affections are unusually distinct at the commencement; but they seldom last beyond a few days, when they change to the adynamic or ataxic. This form is most frequently seen in winter, and in young persons of a sanguine temperament. The *Adynamic* form is the most common; it is marked by the existence of extreme prostration, occurring from the beginning, or supervening in the course of the attack. The progress of this variety is generally slow, the disease often being prolonged beyond the fourth week. In the *ataxic* form the nervous system appears to be early and deeply interested.

IV. MARCH.

The progress of Typhoid Fever is regular and progressive. Sudden changes rarely happen. Daily exacerbations, generally at night, are common, but the remissions are not decided, or lasting.

V. DURATION, &c.

The mean duration of this disorder is from eighteen to thirty-two days. Convalescence rarely happens before the fourteenth

or sixteenth day; although exceptional cases are mentioned, where it was established on the eighth or ninth day. The writer has seen it in several cases extend beyond the fortieth day. Death is infrequent before the seventh day; most fatal cases terminate somewhere between the fifteenth and twenty-fifth days.

Relapses.—Most authors agree that relapses are by no means infrequent.

Recurrence.—Until lately it has generally been held by writers on typhoid fever that it never attacks the same person twice. This opinion has been recently modified by the publication of several undoubted instances of recurrence. Dr. Louis, in a late session of the French Academy of Medicine, stated that he had seen a well-authenticated case of a second attack of typhoid fever. It is, however, no doubt very rare.

VI. COMPLICATIONS.

The most frequent complications of Typhoid Fever are perforation of the intestine, and consecutive peritonitis; hemorrhage; inflammations of the respiratory organs; otitis; erysipelas of the face; abscesses; &c.

1. Consecutive Peritonitis is an accident of the gravest and most fatal character. At the moment of its occurrence a sudden and severe pain is felt by the patient at the seat of the perforation, and which soon extends to the whole abdomen. Where there is extreme debility, or considerable stupor, this symptom may be very imperfect. When present, pressure on the abdomen is intolerable, a general chilliness is felt, the features rapidly change, and there are vomiting and constipation. Death takes place from six to forty hours; though Louis has known an instance where the patient survived seven days. Perforation occurs suddenly; more frequently in mild than severe cases; and generally without any appreciable cause.

2. Hemorrhages.—Intestinal hemorrhage is frequent in the adult; it is never critical; usually causes great prostration; and sometimes death. It is sometimes abundant, the blood being pure, fluid, or in dark clots; at other times the quantity is small, and it is intimately mixed with the fecal discharges. Hemorrhage, alarming as to quantity and effect, occasionally occurs from the uterus. In such cases, the quantity is generally considerable.

3. Pneumonia is met with in about one-seventh of all the cases. It generally occupies the base of one or both lungs. It is more congestive than inflammatory, and is very often latent. Bronchitis, to a greater or less degree, is invariably present.

4. Erysipelas of the Face, Otitis, Parotitis, and Abscesses, sometimes, though rarely occur. We have seen the trunk and extremities covered with successive crops of furuncles, lasting for two weeks, and retarding convalescence.

V. DIFFERENTIAL DIAGNOSIS.

Although there is no one, or even two or three symptoms actually pathognomonic of typhoid fever, there are certain phenomena which occur with such constancy, and with such greater frequency in its course than in any other disorder, that in most cases, when fully established, a certain and timely diagnosis may be made. When a febrile affection, of several days' duration, is attended with early and marked prostration of strength, a puzzled and stupefied physiognomy, epistaxis, diarrhœa, meteorism, pain and gurgling, on pressure, in the right iliac region, diarrhœa, an eruption of lenticular rose papulæ on the chest, belly, or back, sudamina, enlarged spleen, diffused bronchitis, and a pungent heat of the surface,—there can be no doubt, with such an assemblage of symptoms, of the nature of the affection. But most, or all of these may be absent; for in the mild and latent forms of the disease the subjective symptoms are few, ill-defined, unsatisfactory, or even null. In such cases a diagnosis becomes very puzzling and difficult, and a positive opinion should be given with great caution. Still, careful observation, and a familiarity with the disease will frequently enable the physician to decide positively. The *duration* of the attack is, under such circumstances, a valuable element in the diagnosis. When a febrile disorder, accompanied with muscular debility, exists beyond a week, in a person between fifteen and forty, and no local cause can, on careful examination, be ascertained, there is good reason to fear the existence of typhoid fever. An analysis of the blood might be resorted to in doubtful cases, to decide whether there was any local inflammation,—the observations of Andral and others having proved the constant increase of fibrin in all the phlegmasiæ, whilst in typhoid fever, it is either stationary or actually diminished. The age will often materially assist us,—for, as will be presently shown, typhoid fever is comparatively rare after forty. When not seen until an advanced period, and no previous history can be obtained, it may be confounded with other disorders, in which *typhoid symptoms* are common —as puerperal fevers, the last stage of dysentery, glanders, purulent infection, and renal diseases: but further investigation of the circumstances of the case will speedily clear up the diagnosis. The visceral inflammations of old men are often latent, and ac-

companied by extreme debility; here the age, and careful physical exploration will generally elucidate the case. The prodromes of the exanthemata—variola, measles and scarlatina—resemble often those of typhoid fever; but the initial phenomena are rarely adynamic, which circumstance, with the prevalent epidemic constitution, and the characteristic symptoms of each, will prevent an erroneous diagnosis. From enteritis it is essentially dissimilar, as shown by the subjoined tabular view.

Typhoid Fever.	*Enteritis.*
Diarrhœa frequent; often slight.	Diarrhœa constant and copious.
Meteorism frequent.	Rare.
Pain and gurgling in right iliac region on pressure.	None.
Spleen enlarged nearly always.	Spleen never enlarged.
Headache in most cases, and often intense, and from the outset.	Headache rare and slight.
Muscular debility from the outset.	No prostration until the disease has lasted for some time.
Pink lenticular spots.	None.
Epistaxis in most cases.	None.
Heat of skin preternaturally great.	Occasionally slight heat of skin.
Pulse over 100 generally.	Under 80 usually.
Mean duration from 20 to 30 days.	About one week.

VI. PROGNOSIS.

The prognosis should be always guarded, for, independently of typhoid fever being a very fatal disease, perforation of the intestine occurs most frequently in mild cases; this accident is almost necessarily mortal. The younger the subject, after fifteen, the stronger the chance of recovery. Beyond forty the disease is very serious.

When the invasion is slow, a fatal issue is more frequent than when it is abrupt. A sudden remission, followed by a relapse, with aggravated symptoms, is, according to Dr. Chomel, invariably mortal.

The regular prognostic value of particular symptoms may be gathered from the subjoined table. Those under the head of D are the only ones actually warranting a fatal prognosis, and even these occur—mostly rarely—in those who eventually recover.

A *Symptoms which occur with the same or about the same frequency and intensity in fatal cases and in those of recovery.*	B *Symptoms which occur with greater frequency, but not to any notable degree, in fatal cases.*	C *Symptoms occurring with much greater frequency in fatal cases.*	D *Symptoms peculiar to, or with the rarest exceptions peculiar to, fatal cases.*
Diarrhœa. Gastric symptoms. Morbid states of the tongue. Prostration of strength. Epistaxis. Deafness. Tinnitus aurium. Sudamina. Lenticular eruption.	Involuntary dejections. Meteorism. Dysphagia. Ocular injection. Marked rapidity of pulse. Irregularity or intermittence of the pulse.	Intestinal hemorrhage. Delirium *appearing the first day.* Agitation. Somnolence. Spasmodic movements. Extreme prostration of strength from the first. Permanent disturbance of vision in the recumbent position. Erysipelas. Persistence of a small contracted pulse.	Somnolence appearing the *first* day. Perversion of intelligence exhibited by patient declaring himself well, while in reality suffering under very severe symptoms.

The *mortality* varies at different periods, without any apparent cause. In Paris the deaths are about 1 in 3. In Massachusetts General Hospital, from 1822 to 1825, there were 303 cases of typhoid fever and 42 deaths, or about 1 in 7; in 1830, the deaths were 1 in $3\frac{1}{2}$; in 1831, 1 in $14\frac{1}{2}$; in 1829, 1 in 25. From 1832 to 1835, the number of cases was 129, and the number of deaths 22, being a mortality of 1 in a little less than 6; while, from 1836 to 1838, the number of cases was 108, and the number of deaths 7, or 1 in 15. From November, 1836, to November, 1838, there were 55 successive cases without a single death; and the treatment was essentially the same during the whole of these periods. Jacquez, in a recent memoir reported on by Louis at the Academy of Medicine, states that his mortality was 1 in 45.

VII. CAUSES.

1. Age.—The maximum frequency is between eighteen and forty. After forty the liability diminishes, and it is rarely met with in old persons, though there is some evidence to favour the opinion that it may occur even among them, especially in this country, more frequently than is generally believed.*

2. Recency of Residence.—According to the French writers, strangers recently arrived in large towns are particularly obnoxious to the disease. Nothing positive has as yet been ascertained on this subject in this country.

3. Climate.—It is the endemic continued fever of the temperate climates of Europe and this country.

4. Contagion.—Though often arising spontaneously without any appreciable cause, typhoid fever is undoubtedly propagated by contagion. There is an accumulation of evidence on this point which cannot be resisted. It appears, however, certain that the contagion of typhoid fever is much more active in rural districts than in populous cities. Most of the French physicians practising in small towns and in the country, have long advocated the contagiousness of typhoid fever, whilst the Parisian physicians have, until very recently, generally denied it.† Dr. Nathan Smith, as far back as 1824, maintained that it was as contagious as small-pox or measles. The contagious principle is, probably, in most instances, not very active.

* [Gendron mentions three cases between fifty and sixty, and four where they were between sixty and seventy-five. M. Jacquez, in a recent memoir presented to the French Academy of Medicine, notes several persons aged from sixty to seventy, and one between seventy and eighty, whom the disease had not spared. Petit observed the disease in a subject aged sixty; Montault in one sixty-five, and Andral in one aged seventy. Rayer related to the French Academy a well-marked fatal case of typhoid fever in a woman aged fifty-six. A similar case, in a woman sixty-three years of age, is given by Dr. Bartlett. In 1837 Prus read to the Société de Médecine an example in a woman aged seventy-eight.]

† [In July, 1829, Dr. Bretonneau transmitted to the Royal Academy of Medicine a communication, in which he asserted the contagiousness of typhoid fever, as it prevailed in the country.*a* Chomel, in his *Leçons de Clinique Médicale*, published in 1834, inclined to this opinion, though, as he acknowledged, it was contrary to the general sentiment. Dr. Gendron, of Chateau-du-Loirs,*b* in an elaborate memoir, gave a number of indisputable instances of contagion. Dr. Louis, in the last edition of his "*Fièvre Typhoide*," adopts the belief, and in a recent session of the Academy of Medicine, this distinguished authority stated, that he had observed four cases in Paris, respecting which it was impossible for him to entertain a doubt. Contagion appeared to him to be especially manifest when the hospitals were over-crowded. Dr. Moreau, of Paris, in a previous session, related a striking and undoubted instance of contagion. The evidence of Prof. Forget, of Strasburg, Dr. Leuret, of Nancy, Mistler and Ruef, of the department of the Lower Rhine, Putegnat, of Luneville, Jacquez, Patry, &c., is to the same effect, and irresistible.]

a [Archives de Médecine, vol. xxi., p. 57.]
b [Journal des Connaissances.]

VIII. TREATMENT.

Typhoid Fever runs a definite course, with a natural tendency to a happy termination. Young and previously healthy persons pass through the disease favourably, with little or no treatment. In the celebrated Irish epidemic, which has been so often alluded to, the mortality amongst those patients who were placed in sheds on straw, and received no medical attendance, was slight; of sixty cases, allowed by Dr. Piedagnal to run their own course, three only ended fatally; of eight hundred and nineteen cases treated exclusively by the Homœopathic plan, extending over a period of nine years, one hundred and forty died;* and of sixty-three cases, in which the late Dr. Williams, of St. Thomas's Hospital, London, used only simple enemata of warm water, all got well but one. This disposition to recovery should not then be thwarted by meddlesome interference, or mischievous activity. There are no means by which an attack of typhoid fever can be cut short, or its duration even materially abridged. All treatment must be auxiliary, and should be directed towards the shelter, from serious harm, of the essential functions. In the treatment of this affection "he must be reckoned the safest and best practitioner," says the judicious Dr. Watson, "who knows when to abstain from acting, as well as to act; who has learned when and to what extent the case may be left to the salutary processes of nature."

A primary consideration should be a regard to the prevalent epidemic constitution; for this, as has been shown, is constantly changing, and forbids the idea of any absolute system of treatment being established. Whilst in one year evacuants are necessary, in another they may do positive harm, stimulants being demanded from the beginning. The circumstances, too, under which death takes place, vary with different epidemics, and should be particularly noted, as the safest guide to the general principle of treatment—its great object being, in the language of Cullen, "to obviate the tendency to death."

Local complications are the most frequent immediate sources of danger. It becomes then the object of the practitioner to oppose those tendencies to organic change which may be detected. Though, doubtless, often inflammatory in their nature, they are materially modified by the primary affection, and evacuants are, as a general rule, but ill borne in their treatment, their effects differing widely from those resulting from their use in idiopathic inflammations of the same organs. *General blood-letting*, therefore, should be resorted to with great caution, only when the

* [Dr. Fleischmann's Report of the Hospital of the Sisters of Charity of Vienna, quoted by Drs. Drysdale and Russel in Introduction to the Study of Homœopathy. London, 1845.]

necessity is urgent, and during the first days. The bleeding should not be large, the patient being placed, during the operation, in an upright position. The circumstances which justify a recourse to it, are the unequivocal evidence of local inflammation, conjoined with a full, hard, and not very frequent pulse. Severe cerebral symptoms, at an early period of the disease,—intense pain in the head, intolerance of light or sound, violent delirium—conjoined with a hard, active pulse, are often relieved by a moderate bleeding. But it should be recollected that the febrile excitement at the outset is, in a large number of cases, speedily followed by adynamia, and is a fallacious guide for depletion. *Local bleeding*, by cups or leeches, is less debilitating, and usually quite as efficacious in alleviating cerebral, abdominal, or pulmonic complications. Leeches should be used with caution, especially after the first period, and the hemorrhage stopped immediately upon their removal; the writer has seen fatal exhaustion occur from a neglect of this precaution. At the beginning of the attack purgatives may be given with advantage, unless diarrhœa should exist to any degree.

1. *Cerebral complications* are to be combated by general and local bleeding—leeches to the temples and behind the ears, or cups to the back of the neck, with the precautions indicated,—the removal of the hair, and constant cold applications or evaporating lotions, and stimulating pediluvia. Sleeplessness and agitation, accompanied with mild delirium, frequently abate on the exhibition of opium; but it should be administered with the greatest caution, and not until arterial excitement has subsided, or if there is any disposition to coma, (see p. 220.) When coma is profound, Dr. Watson recommends highly a blister to be applied to the shaven scalp.

Nervous tremors, subsultus, &c., frequently yield to camphor, musk, opium, &c.

2. *Abdominal complications.*—Pain and tenderness in the umbilical and cœcal regions are often relieved by light warm poultices, rendered slightly stimulating by mustard, and by turpentine fomentations. When the pulse and urgency of these symptoms warrant the abstraction of blood, leeches or cups may be resorted to. Moderate purging, at the beginning of an attack, is serviceable; and the bowels should be kept free by laxatives or enemata throughout its course. If the diarrhœa is excessive, small doses of mercury and chalk may be given, or it may be necessary to resort to astringents, or even to opium, when not contra-indicated by the presence of cerebral symptoms. Excessive tympanitis is most effectually relieved by the exhibition of turpentine in small doses, or of enemata of turpentine and assafœtida. Dr. Schoenlein, of Berlin, recommends, as the most.

effectual remedy for the relief of this symptom, frequent enemata of cold water.

3. *Pulmonic complications.*—When the chest symptoms are urgent, blood may be abstracted locally, regard being had to the stage of the disease, and the state of the circulation. Fomentations of turpentine produce great relief in the congestive pneumonia of the latter period; and the carbonate of ammonia enjoys a good deal of reputation under the same circumstances. A constant change of position is of primary importance, both in preventing and relieving the hypostatic congestion of the advanced stages of the disease.

Whilst we meet the urgency of the intercurrent affections, we should not be unmindful of the system at large, or forget that the patient may perish from mere exhaustion or asthenia. The state of the circulation must be carefully watched, and its condition be our guide in the administration of stimuli. Wine, brandy, the carbonate of ammonia, quinine, &c., should be given after the first week. The evidence of their utility is to be found in an amelioration of the symptoms on their exhibition—by the falling of the pulse, and its increased force; the cessation of the delirium; and the improvement in the secretions; if, on the contrary, the febrile excitement is increased, the delirium aggravated, &c., they should be discontinued. As a general rule, however, their free exhibition is attended with benefit, and the fault usually committed is not resorting to them sufficiently early.

The patient should be placed under the most favourable hygienic conditions; he should be withdrawn from the influence of all unfavourable or aggravating circumstances; perfect quietude of mind and body should be strictly enjoined; together with free ventilation, light bedding, great cleanliness. The body should be repeatedly sponged with tepid or cold water, according to the feelings of the patient, to which vinegar or some aromatic spirit may be added. To abate the urgent thirst, felt at the beginning, the mildest drinks, iced and slightly acidulated, if grateful, may be given, in small quantities at a time. For the first three or four days, absolute diet should be observed; after that period nourishment should be *regularly* given, by day and night; the quantity should be small, and the intervals short. Beginning with the light farinaceous articles, the animal broths, milk, eggs, jellies, &c., may afterwards be permitted; finally, when the prostration is extreme, the strongest beef tea is necessary. If there is one point in the conduct of continued fever more to be insisted on than another, we believe that it is the due and proper administration of nourishment.—Frequent examination should be made of those parts of the body exposed to pressure; they should be subjected to gentle friction, and the air or water cushion used.

The condition of the bladder should be ascertained from time to time, and the water drawn off when necessary.

During *convalescence* great care and vigilance are required; the condition of the patient should be narrowly watched, and the slightest return of evening feverishness should receive immediate attention. The diet should be regulated with extreme caution, relapses being not unfrequently produced by some indiscretion in regimen. Exposure to cold and fatigue, and mental excitement of any description, are to be especially avoided.

A number of specific methods of treatment of typhoid fever have lately been proposed. One cures all his cases by purgatives, or emeto-cathartics; another is equally successful with small doses of the nitrate of silver; whilst a third lauds the extraordinary power of alum, or chlorine water. In a disorder where so many recover spontaneously, there are too many difficulties and sources of fallacy, to warrant our attributing to any exclusive method of treatment, the merit of effecting cures, especially when such a plan is repugnant to analogy or general therapeutic principles.

IX. IDENTITY OF TYPHUS AND TYPHOID FEVER.

The question of the identity of typhus and typhoid fever has been one of great interest, and respecting which much diversity of sentiment at one time prevailed. Whilst the British physicians held, with great unanimity, the opinion that, though different varieties, they were the same species of fever; the French and American authorities proclaimed their essentially dissimilar nature. For obvious reasons the present work is not suitable for the discussion of this point; and it is our intention merely to state the grounds on which those who contend for the non-identity of the two diseases base their opinions, and to ascertain how far they are in accordance with the observed facts. The leading features of difference insisted on to prove that the two varieties of fever—typhus and typhoid—are radically distinct, are, 1. The character of the eruption, which in typhoid fever consists of minute lenticular papulæ, disappearing on pressure, and thinly scattered over the abdomen and chest; whilst in typhus the spots "are more irregular in their shape and size; not elevated above the adjacent skin; partially disappearing on pressure, or not at all; often abundant, or even confluent; in many cases occupying the skin of the extremities as well as that of the entire trunk, and usually of a duller and more dusky colour than in the former disease."* 2. The infrequency of the abdominal symptoms—diarrhœa, and pain and gurgling on pressure in the right iliac region—in typhus,

* [Bartlett, loc. cit., p. 270.]

which occurs so constantly in typhoid fever; and, 3. The absence in typhus of the characteristic intestinal lesions—specific alteration of the agminate and isolated follicles—of typhoid fever.

Let us briefly examine how far these asserted differences are sustained by observation, assuming, for the purpose of having some distinctive or pathognomonic trait assigned to typhoid fever, that a diseased condition of the glands of Peyer is necessary to constitute the disease.

Dr. Gaultier de Claubry* has demonstrated the complete identity of the camp and jail fevers of the Continent of Europe, with the typhoid fever of Paris, which, again, has been proved to be identical with the prevalent form of continued fever in the northern and middle sections of this country. The typhus of camps, hospitals, and prisons, which prevailed so constantly in every part of Europe, at different periods, from 1742 to 1815, was, as to symptomatology, march and pathology, the form of fever described by Louis, Chomel, Forget, &c. In the last edition of his work on Typhoid Fever (1841) Dr. Louis has recognized the perfect identity of two diseases.

Between the first of October, 1839, and April, 1840, an epidemic continued fever prevailed in the prison at Rheims, in France, and which has been faithfully described by Dr. Landouzy.† The epidemic in question was confined to the inmates of a certain quarter of the prison at Rheims, and prevailed between the 1st of October, 1839, and April, 1840. The entire number of cases was 138, 103 of which were amongst the inmates of the prison; the remaining 35 consisting of physicians, medical students, nurses, and others connected with the hospital where the patients were treated. An important point connected with these cases is, that they all came under the observation of the medical attendants immediately on the commencement of the disease. Among the first symptoms was stupor, which frequently showed itself as early as the second or third day, and continued until it was lost in coma or delirium. It differed from mere somnolence and coma. The expression of the countenance was that of half-demented and stupid astonishment. It was the *stupor attonitus* of Foes. In half the cases it was strongly marked, in the other half it was slight in degree. True somnolence and coma appeared in a certain number of cases, later in the disease, often about the tenth day. Profound coma, so that the patient could not be roused, existed in only twelve cases. Delirium was very common, usually making its appearance between the third and the eighth day. It was generally low and muttering in its character, and, in fatal cases, it continued until death. Headache

* [De l'Identité du Typhus et de la Fièvre Typhoide, &c. &c., Paris, 1844.]

† [Archives Générales de Médecine, &c., Paris, 1842. Bartlett, loc. cit., p. 302.]

was uniformly present at the commencement of the disease. It was, for the most part, dull and heavy, and felt especially over the eyes. It continued for an uncertain period of time, gradually disappearing or losing itself in coma or delirium. *Subsultus tendinum* was common, and strongly marked in grave cases. Redness of the eyes, *tinnitus aurium*, and deafness were present in a certain proportion of cases, but differed in no obvious particulars from the same symptoms in typhoid fevers. There was great loss of muscular strength, from the beginning of the disease. In every case except the first, which was not carefully examined, there was an abundant cutaneous eruption, consisting of small spots, or *ecchymoses*, of a red, violet, or black colour, not elevated above the skin, and not disappearing on pressure. They were always found on the chest, often also on the abdomen, and in some cases they extended to the arms and legs. They commonly showed themselves about the fourth or fifth day, and gradually faded away between the tenth and the eighteenth. They were abundant and confluent in proportion to the gravity of the disease. The bodies of the sick exhaled a strong, offensive odour, resembling that of mice. In regard to the absence of appetite, to thirst, the state of the lips, tongue, and mouth, nothing special was observed, differing from what occurs in typhoid fever. Nausea was present at the commencement of the disease in all the cases. *Meteorism and abdominal pains were uniformly absent.* There was diarrhœa in the beginning of the disease in only four cases. In all the others there was no apparent disturbance in the functions of the intestinal canal. The bowels were more inclined to constipation than to looseness. A distinct, well-marked sibilant rhonchus was present in all the cases. Epistaxis occurred in eight cases. The temperature of the surface was uniformly elevated; the heat was dry and burning. In no instance was there gangrene of any part of the body. In the six autopsies which were performed, the intestinal lesions characteristic of typhoid fever were present. The elliptical plates were either thickened and elevated, or they were the seats of ulcerations; and the mesenteric glands corresponding to them were enlarged. *The spleen was not increased in size in any of the cases:* in four it seemed somewhat softened.

On the 17th of January, 1842, an epidemic fever broke out in the barrack of the municipal guard of Stockholm. The corps had been remarkably healthy for the five previous years, and occupied its usual quarters, which were very damp, especially in winter. The men were lodged in large and spacious wards, fourteen feet high, in each of which forty-four persons slept, two in a bed. The food and clothing were of the best description. For two months previous to the occurrence of the epidemic, the men were in the habit of returning to their quarters almost drenched

to the skin, and their wet clothes were hung up in the room in which they slept. The atmosphere was loaded with moisture, and fresh air was admitted as sparingly as possible, in order that an elevated temperature might be maintained. The age of the patients ranged from 19 to 52 :—23 were under 25 years; 20 from 25 to 30; 12 from 30 to 35; 6 from 35 to 40; and 3 from 40 to 53. Of 64 persons attacked 62 recovered. The cases are divided into three categories. A. Cases with predominance of cerebral symptoms, (*twenty-two cases.*) B. Cases with predominance of abdominal symptoms, (*twelve cases.*) C. Mixed cases, (*thirty cases.*) The premonitory symptoms, which were seldom entirely wanting, were prostration, anorexia, dizziness, pains in the head and loins, with occasional chills and troubled sleep, during an average period of three days. In classes A and C epistaxis now and then occurred; and in B and C diarrhœa, nausea, or colic, was sometimes met with during the period of incubation. The subsequent symptoms were those of typhoid fever. In classes B and C there were, in nearly all, ileo-cæcal pain and gurgling on pressure, with diarrhœa; whilst in A there was constipation, and the belly was soft and free from pain; in all the cases there was an eruption, consisting of reddish spots, of irregular form, and varying in magnitude, from a minute dot to the size of a bean, disappearing momentarily on pressure, more or less abundant on the chest and shoulders, very rarely seen on the face or abdomen, bright red at first, usually on the third or fourth day they gradually became darker, assuming frequently a bluish or violet-blue tint. The duration of an attack was about fifteen days. Of the two deaths, one took place on the fifth day, when the heart was found softened, the blood decomposed, the spleen broken down, (*en bouille,*) and Peyer's glands enlarged, but not ulcerated. In the other fatal case convalescence had commenced on the thirteenth day, when the patient undergoing some exposure, pneumonia occurred, and he died on the seventeenth day. The spleen was softened, with a bluish-gray colour of Peyer's glands, "with some of the orifices of their ducts evidently enlarged."*

Dr. Felix Jacquot, a French army surgeon, had opportunities of observing epidemics of typhoid fever at Paris, Lyons, Vosges, Strasburg, and Metz. At Lyons, the lenticular spots, with petechiæ and ecchymoses, were frequent. At Metz, sudamina were occasionally met with, and nothing else eruptive was seen. At Lyons, pulmonic complications were rare, whilst at the civic hospitals they were so common, that Dr. Dupasquier was led to believe that pneumonia was the anatomical character of the disease. In one epidemic, diarrhœa was a prominent, early and constant symptom; whilst in another, constipation was general.†

* [Gaz. Méd., t. xii., Nos. 15 to 26, 1845.]

† [Gazette Médicale, t. xii., Nos. 33, 34, Paris, 1845.]

Dr. John P. Mettauer, in an excellent paper on Continued Fever, as it prevailed in Middle Southern Virginia, from 1816 to 1829 inclusive—a period of thirteen years*—says, "these varieties of fever have prevailed at different times; that is, the Synocha, the Typhoid, and the Typhus. Synocha, which was only the more open and well-developed form of the disease, prevailed during dry and warm, and warm and damp seasons, and always as an endemico-epidemic of considerable extent. From 1816 to 1821, both years included, and especially during the warm months of those years, this was the predominant form under which continued fever appeared; and it was uniformly distinguished by the open characters of a well-marked inflammatory fever in a large majority of cases, throughout its more acute stage. During these years, too, all classes and conditions of society were equally affected by the disease, and, with few exceptions, it did not part with its peculiar open characters until the setting in of cold weather. Many cases of ordinary continued fever, or as it is often termed typhoid fever, and typhus, also occurred during this period, though their number was small until after winter set in. From 1822 to 1829, the typhoid and typhus varieties were the predominant fevers, but there were also many cases of the synocha type to be met with, both during the warm and cold seasons of this period; and these fevers were almost exclusively confined to certain districts and neighbourhoods, favourable to the generation of a peculiar miasm, such as is believed to be formed during the slow decomposition of ligneous substances. Typhus did not generally make its appearance until many cases of the typhoid affection had previously occurred in a family; but when it did take place, it was invariably distinguished by early cerebral disturbance, especially depression of the nervous energies. The face of the country and climate of the region in which this fever prevailed, presented nothing calculated to lead to the belief that it was necessarily obnoxious to the disease. The lands are more or less broken and undulating; they abound in numerous small water-courses, and creek-flats which readily overflow; and many of the small streams dry up during protracted droughts. The climate is not more variable than is usual in middle Virginia. With the exception of two of the years embraced in this history, there was nothing very remarkable or peculiar in the seasons favouring the production of continued fever. 1816 was distinguished by an unusually dry and cool summer. From May until October, there was not rain enough to wet the earth an inch, consequently nearly all of the water-courses large and small dried up. There were many instances of wells and springs failing entirely during this year, which had never been known to be mate-

* [Am. Journ. Med. Sciences, July, 1843.]

rially affected by droughts before. And the summer of this extraordinary season was so cool as to be attended with frost every month. This was a year of fever, and the disease assumed the synocha form, distinguished by well developed, and highly inflammatory characters; and it prevailed most extensively, especially during the warm months. Towards the close of September, the cases of typhoid fever, which until then had not been numerous, multiplied rapidly, and soon became decidedly the predominant form, and maintained the ascendency during the succeeding winter. In 1827, another exceedingly dry summer occurred: this year was also distinguished by the almost universal prevalence of the synocha form of continued fever, though there were occasional cases of the typhoid and typhus varieties likewise to be met with. The summer of this year was very nearly as dry as that of 1816, but it was exceedingly warm. As autumn approached, typhoid cases increased in number, and soon became the predominant fevers. But after winter set in, which was damp and remarkably mild, genuine typhus rapidly increased, and continued to do so the remainder of the season, and throughout the next year. The years not particularized in the foregoing sketch, were not distinguished by anything remarkable in a meteorological view, but they were years of fever; and the disease appeared chiefly under the typhoid and typhus forms, nearly in an equal proportion, though cases of synocha were often met with likewise. 1816 and 1827 were decidedly the sickly years of the period embraced in this paper; and, as already remarked, the synocha was the predominant form under which the disease appeared. In many instances the fevers of these years could be satisfactorily traced to malarial sources, especially at the commencement of the sickly season. But a vast number afterwards were as clearly referable to idiomiasma, or something like contagion, particularly as cases of fever multiplied in families, and as cold weather approached, or as the rigors of winter increased. Numerous cases occurred after the cold weather of the winter season set in, with individuals residing in uninfected neighbourhoods, who had assisted in nursing sick relatives; and such persons often communicated the disease to their families and neighbours who had assisted in nursing them. The propagation of every form of this fever by something like contagion was established by indubitable evidence in many instances; but it was not very communicable until it had continued in a family some time, more especially the synocha and typhoid varieties. The difference in the communicability of these forms and typhus was, that many cases of the former, or one of long continuance became necessary to their propagation by the contagious agency; while a solitary example of the latter in many instances was sufficient to communicate it. In a few instances we were induced to be-

lieve that fomites propagated these fevers, as washerwomen residing in neighbourhoods remote from the seats of the disease, who had received and washed the clothes of the sick, and who were exposed in no other manner, had regular attacks of them.

"No age was exempted from continued fever; infants at the breast, and individuals upwards of sixty years old, with every intermediate age, being affected. Being between the ages of eighteen and thirty years was that most obnoxious to this fever. The black population were most subject to typhus, and the depressing forms of the typhoid variety.

"The disease was frequently superinduced by catarrhal affections, especially during variable seasons. Measles; hooping-cough; chicken-pox; worms; conception; parturition; excesses in eating and drinking; surgical accidents and operations; terror; passion; grief; despondency; intense study; long fasting; colic; fatigue; and some others, at different times, also seemed to excite the disease, but as accidental or occasional causes.

"The *anatomical characters* which were displayed during our post-mortem examinations* were lesions of the glands of Peyer; of the mesentery; spleen; mucous membrane of the small and large intestines; of the peritoneal coat of the small intestines and stomach; of the meninges of the brain, and especially of the arachnoid; effusion of serum, or blood and serum into the ventricles of the brain; congestion or softening of the lungs, and gangrene of the bladder. A dissolved state of the blood was also occasionally met with as a post-obit appearance, especially in fatal cases of typhus: in such cases the lungs were more or less disorganized; and in every instance the membranes of the brain were greatly congested."

An epidemic of continued fever which occurred at the Lane Seminary, Ohio, during the autumn of 1842, and the ensuing winter, has been described by Dr. Thomas Carroll, of Cincinnati, in the Western Journal of Medicine and Surgery, for 1843. In nearly all the cases diarrhœa, meteorism, and pain and gurgling in the ileo-cœcal region, are mentioned as present, and yet in many of the fatal cases Peyer's glands were perfectly healthy; but ulcerations were frequent in the large intestines.

In October, 1845, the writer saw several cases of continued fever in the wards of the Philadelphia Hospital, in emigrants just arrived, in which there existed, along with the abdominal symptoms of typhoid fever,—diarrhœa, and pain and gurgling on pressure in the right iliac region—the maculated eruption he had previously seen in the typhus of Dublin and London.

From these facts—few, it must be acknowledged, yet positive

* ["We treated more than four hundred cases from 1816 to 1829, and lost only twenty patients. Many of the cases were of the most unpromising description, perhaps a fifth."]

as far as they go—it is evident, 1. That there is no necessary or constant connection between the kind of eruption, and the abdominal symptoms or lesions;—that the lenticular eruption of the Paris fever, and the maculated, measly eruption of the Irish typhus may exist conjointly with diarrhœa, and pain and gurgling in the ileo-cœcal region, and with enlarged or ulcerated patches of Peyer. And 2. That there is no constant relation between the abdominal symptoms—pain, gurgling, and diarrhœa—and the intestinal lesions, since all these symptoms may be absent, not only in individual cases, but in a portion, or in the whole of those attacked in the course of a given epidemic.

We would inquire whether the group of symptoms known as typhoid fever is perfectly identical at all times and at all places; and further, if the essential characters of typhus are so constant or defined, that it can be taken as a fixed term of comparison? Do not epidemics of typhoid fever differ in their prominent phenomena, constantly, from sporadic cases, as well as from each other? Are there not a number of accessory circumstances, so subtile as to escape observation, perpetually modifying the influence of causes on the organism? General conclusions should not be drawn from limited observations, or from witnessing any disease so generally prevalent as the one under consideration, in a single district, or even country, and during a limited period of time. And we cannot avoid thinking that those who regard these two forms of fever as distinct and separate *species*, are premature in the expression of an opinion upon a subject in which there are, as yet, wanting many essential elements to warrant a positive judgment.

X. TYPHOID FEVER OF CHILDREN.

Typhoid Fever is rare in the first years of life; it is more common between the ages of five and eight; and is quite frequent between nine and fourteen. Of 121 cases collected by Dr. Taupin, 10 were children of four years of age; but of those cited by other writers, the range is between eight and fourteen. Of 111 cases recorded by Rilliet and Barthez, 81 were boys, and 31 girls; and of 121 observed by Taupin, 86 were boys, and 36 girls.

It occurs sometimes epidemically. This has been noticed at the Children's Hospital at Paris, and Dr. Rilliet saw an epidemic typhoid fever in a small village, near Geneva, which attacked children only.

The *Anatomical characters* are the same as in the adult; and the secondary lesions are met with in about the same proportion. The follicular ulcerations are, however, according to Rilliet and

Barthez, less extensive and numerous, and occur more slowly, and cicatrization is more rapid, and inflammation and softening of the mucous membrane of the large and small intestines much more frequent; they met with them seventeen times out of twenty-seven.

The *symptoms* are similar to those which characterize the disease in the adult; though some of the more prominent occur with less constancy—as the rash, catarrhal phenomena, and epistaxis. Rilliet and Barthez state that the abundance of the eruption is in inverse proportion to the severity of the attack. The same authorities assert that the spleen is less frequently enlarged, but this is denied by Taupin. The tongue, though dry, is rarely cracked or fissured; retention of urine is very rare; and so also is delirium, especially at the outset; and when it occurs, it is never violent. Vomiting, particularly at the beginning, is frequent.

The most common *complication* is *enteritis;* whilst peritoneal perforation, intestinal hemorrhages, and gangrene of the integuments, are extremely rare. *Otitis* is not unfrequent.

The *differential diagnosis* is often extremely difficult. From *enteritis* it is sometimes impossible to distinguish it; and the distinction between typhoid fever and meningitis is often difficult and impossible.

The editor thought it better to give separately a short sketch of the form of continued fever most prevalent in this country, even at the risk of some repetition. The prominent and distinctive features, both of the symptomatology and pathology, have alone been dwelt upon to avoid tedious reiteration, the reader being referred for particulars to the preceding chapter.

Erratum.—At page 240, 5th line from top, for *objective* read *subjective.*]

CHAPTER IV.

PLAGUE.

The Plague, or *Pestis* of Cullen is a disease almost exclusively of eastern occurrence, for though it may occasionally extend rapidly to more distant parts, yet Egypt and the neighbouring countries appear to be the proper and more frequent seats of its devastations. This disease has been variously defined by different authors; the most applicable definition is that offered by Dr. Brown:—"An exanthematous disease, the eruption consisting of buboes, carbuncles, and pustules, white, livid, or black, and generally attended with malignant and very fatal fever." (*Cyc. Pract. Med.*, Art. Plague.)

I. SYMPTOMS.

It is a remarkable fact in the history of plague, that no very marked *premonitory* symptoms precede its attack: judging from the analogy of other exanthematous fevers, it might have been anticipated that a disease so appalling in its nature, and so frequently fatal in its consequences, would have been preceded by some kind of warning. This is, however, not the case; at least such appears to be the impression of those who have enjoyed the greatest opportunities of watching the whole series of phenomena attending its occurrence. Sir A. B. Faulkner (*Edin. Med. and Surg. Journ.*, vol. x.) says, that "the suddenness with which plague attacks its victims is altogether incredible, persons being known to enjoy every appearance of good health a few minutes before its attack;" and Bulard, who is the most recent writer on the subject, says distinctly, that "plague has no premonitory signs." (*Dublin Journ. of Med. Science*, vol. xiii.)

The first stage of the disease commences generally by a not very distinct rigor, attended by a sense of much weariness and lassitude, immediate depression of spirits, pain and weight of the head, with sudden attacks of giddiness and dull throbbings. The countenance assumes an expression of exhaustion and anxiety. The eyelids are half closed. The eye is downcast, dull and sleepy; the mouth half open, expressive of weakness and feebleness of purpose. There is an indescribable feeling of anxiety about the precordia, extreme restlessness, not from this cause only,

but from absolute pain referred to the heart itself. This is occasionally so considerable, as to become urgent in the extreme: sometimes there are shuddering, nausea, and vomiting. As this first stage advances, the gait becomes staggering and uncertain, not unlike that of a drunken man. This weakness rapidly increases, until at length there is total inability of either walking or standing. The head sinks upon the chest, and the patient seems unable to raise it. The whole muscular system appears to be powerless and relaxed. The patient not unfrequently feels faint, but very rarely passes into a state of syncope. In other fevers this symptom usually occurs late in the disease and on the patient's sitting up, whereas in plague this position seems less to produce it than the horizontal; nor is it so soon recovered from in this posture as in other fevers. (*Russell on the Plague*, p. 89.) The eyes become more dull and sunk; the complexion opaque and dingy; and the haggard character of the countenance is greatly increased, the fixed anxiety of its expressions being only interfered with by twitchings and convulsive movements of the features. The skin is hot, dry, and harsh to the feel. The præcordial pain, as well as that in the heart itself, becomes more intense and more circumscribed. The vomiting, which now usually takes place, though it is seldom of a green colour, is for the most part bilious; sometimes, however, it consists merely of the fluids which have been taken. The tongue is swollen (a very marked symptom of plague), covered with a white fur, which towards the centre glistens like mother of pearl; towards the tip and edges it is moist and clean. The pulse is accelerated, small, and contracted. Bulard describes it as miserably small, beating from 115 to 130: sometimes, however, it is not more frequent than natural. The respiration becomes laborious, short, and hurried; and although the voice is not altered, the speech is thick, indistinct, and faltering. Darting pains are now felt in the axilla and groins, as well as in other parts of the body. On examination, these are found to be connected with swellings in the neighbourhood: should these swellings have their seat in the glandular system, they constitute the bubo; should they be in the muscular or submucous tissue, they are the carbuncle; both of which, when taken in conjunction with the other symptoms, are characteristic of the existence of plague. These usually present an inflammatory appearance, being, in the more favourable cases, of a bright red colour, and of a livid or purple in those of a more dangerous aspect. The bowels are confined, and not easily acted on by medicine. The urine is high coloured, scanty, and sometimes entirely suppressed.

This first stage, which usually lasts for about twelve hours, is succeeded by the *second*, essentially one of reaction. The patient

becomes more agitated, and is incessantly changing his posture, in the vain hope of relieving the urgent pain that oppresses him. Russell (*op. cit.*, p. 88), says, that, "when asked where the pain lay, the patients either answer hastily, 'they cannot tell,' or, with a fixed, wild look, exclaim 'kulbi! kulbi!' (my heart, my heart!")" Should sleep be attained, disturbing dreams render it unrefreshing. The mind is unsteady and wandering, but delirium is very rarely observed, the unsteadiness of the intellect, which becomes particularly marked during the febrile exacerbations, subsiding into simple confusion during the frequent intermissions that take place. Sometimes this state of mind alternates with coma—a condition which argues a severe form of the disease. The patient is impatient of being asked questions about himself; and even when the power of reply remains, which sometimes is not the case, refuses to answer. Besides the functional impediment in the speech, which has been noticed, there may be observed, as the disease advances, trembling of the tongue; this symptom rarely occurring, however, until the patient has been ill for two or three days. The countenance now assumes a peculiarly confused expression. In addition to its dull, heavy, and haggard appearance, it becomes lively and excited. The eye still retaining its muddy aspect, is yet strangely mingled with an unusual lustre; the pupil is very much dilated. This state of the eye continues independently of any remission in the symptoms. The pulse becomes hard and full, but not increased in frequency; sometimes, however, it is so low as to be scarcely perceptible; at other times it is fluttering and intermittent. The tongue is now much increased in size, dry, parched, and of a yellowish colour, with a red streak down the centre and at its edges; then brown, cleft, and like horn (*Bulard*); but it never acquires the thick fur and the black colour so often observable in other malignant fevers. The teeth, lips, and lining membrane of the nose, however, are coated with dark sordes resembling soot. This, as it dries, assumes the form of powder, and falls off. The pain in the stomach, which is intense, is aggravated by the occasional vomiting of a blackish-coloured fluid; sometimes there is distressing nausea, which no vomiting, either spontaneous or artificial, appears capable of subduing. The state of costiveness which prevailed at the onset of the disease, is now superseded by a tendency to a relaxed state of the bowels; the evacuations are black and offensive, though less so than in fevers of the typhoid character; occasionally they are mixed with blood, and passed involuntarily without pain; in other cases they consist almost entirely of a dark grumous fluid. Not unfrequently hemorrhage takes place from other mucous surfaces; most frequently, according to Russell, from the nose and uterus. Generally speaking, if the loss of blood be considerable, fatal results are the consequence, especially if it occur at the advanced period of

the disease. Should the hemorrhage, however, proceed from the nose during the first moments of reaction, there is not much cause of alarm. The uterus appears particularly excitable during plague, catamenial hemorrhage often supervening upon the other symptoms. In case of pregnancy, abortion with its evil consequences is almost certain to occur.

Perspirations frequently take place—a symptom which experience proves to be of the highest importance in controlling the character of the disease; in fact, of all the excretions, this seems to be the most important in its effects. When there is suppression or deficiency in this respect, the worst consequences may be anticipated; while on the other hand, if a free and open perspiration supervene upon the dry hot skin, and a remission in the symptoms follow, it is almost certain that the crisis has taken place. This favourable result usually occurs in an early period of this, the second stage, and is characterized by a general abatement of the excitement; by the pulse falling to about eighty or even seventy, maintaining, at the same time, a steady, open character; by the expression of the countenance becoming more natural, the eye more clear, the conjunctiva losing its injected appearance, the pupils being no longer dilated; in short, by a general amelioration in all the symptoms, while the buboes enlarge, become more active, and suppurate, or the carbuncles suddenly appear with broad surfaces, sometimes to the extent of four or five inches. Should, however, the disease assume a fatal tendency, the general surface of the skin remains dry and harsh, while the face and hands perhaps are covered with a cold sweat; the pulse becomes small, fluttering, and almost imperceptible; there is constant low, muttering delirium; the breathing is hurried and laborious; the eye sunk, so that the countenance has a ghastly expression; and the skin covered with petechiæ and vibices, though the buboes and carbuncles are not fairly developed. The powers of life are now evidently giving way, and death generally ensues without a struggle, though Sir A. B. Faulkner (*Edin. Med. and Surg. Journ.*, vol. x.) says, that "death very rarely follows a gradual extinction of the powers of life; in the greater number of cases it is ushered in unexpectedly by some violent delirious effort, or suddenly terminated in convulsions."

Such are the usual symptoms of the more common form of the disease; many variations, however, occur, but before we enter upon a description of these, it is necessary to make a few observations on some of the leading symptoms of the disease.

The bubo, which forms so prominent a feature in all histories of the plague, is a glandular inflammation. The glands most usually affected are the inguinal and the axillary; in fact, with

the exception of the parotid, maxillary, and cervical, which are occasionally inflamed, the glands in other parts of the body are seldom implicated. The two latter, indeed, are rarely enlarged, unless in conjunction with the parotid gland, or there be some carbuncular eruption in the vicinity, so that the glandular affection appears rather to be the result of a local irritation, favoured by a predisposition to glandular inflammation, than an element of the disease. Even under these circumstances, they scarcely ever pass into suppuration. The parotid is most frequently affected in children. They increase more rapidly, acquire a larger size, and are harder than other buboes; at the same time they are more indolent, and disperse very slowly. When suppuration takes place it is superficial, little of the glandular structure being destroyed. The great size which they occasionally attain without suppurating, appears to produce suffocation, and in this manner to be the immediate cause of death.

The first indication of the formation of a bubo is an occasional darting pain in the immediate region of the gland; there are no external signs of its existence until some hours after, when a deeply-seated hard round tumour, evidently movable and painful on pressure, becomes perceptible. The integumental covering is at first in no way discoloured. As the bubo increases, which it may do in the course of two or three days, the acute pain assumes a heavy obtuse character, excepting in those of a very irritable disposition. The swelling becomes visible to the eye, and on examination is found to be of an oval form, and in a great measure immovable. The skin, though thickened, does not show any signs of inflammation, until the bubo has existed eight or nine days; it is then tense, painful, and discoloured. During the next ten days the signs of its progressing to suppuration are evident; on the fifteenth or twenty-second days the tumour becomes flattened, and an external opening takes place through the discoloured integument, by which the matter is discharged. A slow healing process then ensues; and finally on recovery, a scar is left, the appearance of which is never obliterated. Occasionally, however, the course which a bubo runs is much more rapid; when this is the case a fatal termination may be anticipated. (Russel, *op. cit.*, p. 115.) On the other hand they often disperse gradually, and are ultimately wholly absorbed. A circumstance which takes place, apparently very frequently, is the alternate rising and subsiding of the bubo; one day it looks prominent, another day it appears to have receded entirely, or at least to be much diminished: though there can be no doubt that this is sometimes really the case, yet more frequently it is merely in appearance, and seems to depend on some change in the superficial integument, for, on more minute examination, the subjacent gland will be found unaltered.

Besides these, which are the true plague bubo, authors describe the *accessory* and the *spurious*. The accessory buboes (unlike the bubo whose course has just been described, and which occurs at the onset of the disease), do not make their appearance until after the disease has fully set in, the period varying from some hours to many days; in the latter case it is generally observed that an exacerbation of fever attends their formation. The spurious bubo, which has been particularly described by Russell, is a small, hard subcutaneous swelling, rarely making its appearance before the third day. It occurs on nearly all parts of the body. In its early stage it appears to be fixed, but the superjacent skin, unless inflamed, can be moved over it. It is not so painful as the true bubo, nor does it suppurate so rapidly. The integument retains its natural colour until the sixth or eighth days, when the swelling becomes considerable and protuberant, differing in this respect from the carbuncle or erysipelatous phlegmon. Excepting on the scapulæ and back, where they occasionally acquire a very large size, they rarely exceed that of an ordinary hen's egg.

The carbuncle rises first as a vesicular eruption, of a roundish shape, and slightly protuberant. The upper surface is of an uneven, wrinkled, grayish appearance, and contains a dusky yellow or blackish fluid; on this being discharged, the surface beneath has an inflamed aspect, with a dark, gangrenous spot in the centre: this usually takes place on the third day. As the carbuncle advances, it becomes of a livid hue, surrounded by an angry state of the integuments; its centre forms a gangrenous crust, which gradually extends and covers over its whole surface. In those cases which terminate fatally, this crust remains dry; but if a favourable turn in the symptoms takes place, matter is formed beneath, by which it is separated and thrown off, exposing a deep and unmanageable ulcer. This is the more usual form of carbuncle: authors have, however, described many varieties. As these differences involve much minute description, and are of no essential service as regards prognosis, we shall not dwell upon them here, but pass on to their general history. When these eruptions occur, they do so generally in connection with buboes. They are often very numerous, usually appearing in the more advanced periods of the disease, but never later than the eighteenth day; sometimes, however, they make their appearance on the first day of the fever. The whole external part of the body seems liable to them. It has not unfrequently been observed, that, on carbuncles occurring on the hand, or arm, sympathetic swellings of the glands of the axilla take place: this also, though more rarely, occurs in the glands of the groin, when the leg or foot has been the seat of the carbuncular inflammation. In these cases, however, the buboes are less painful, and altogether of a different

description from the primary bubo. If the carbuncle pass into a kindly suppuration, they subside gradually and entirely. Occasionally, during the progress of the plague, common boils occur; which, though at first resembling some of the varieties of carbuncle, are evidently not identical. They rise suddenly to a point, and pass rapidly into suppuration.

Petechiæ are not very common; they usually occur in the form of small, dusky red, or pale purplish spots, not unlike fleabites, which, as the disease progresses, acquire a livid hue. They are not numerous, and are situated at some distance from each other. They rarely appear unless at a late period of the disease, and then only when the symptoms assume a peculiarly low putrid character. The skin covering the breast and mastoid muscles is their more usual seat.

Purplish spots* and streaks make their appearance sometimes separately, sometimes together; authors have described the former under the name of *maculæ magnæ*, and term the latter vibices. They are essentially the same eruption, only varying in shape, presenting in one case the character of a bruise after a blow, in another of a bruise after a stripe or lash. They are often not observable, until death has taken place; when they make their appearance before, they are the forerunners of this event. Of the same character also are lengthened narrow streaks, of a livid or reddish purple colour. These lines frequently occur on the face, to which it gives a hideous and altered expression, so altered that patients, under such circumstances, can rarely be recognized by those most intimately acquainted with them. Besides these, eruptions of an evanescent character occasionally take place. Sometimes the integument assumes a variety of dull colours; different shades of blue and red, giving to many parts of the surface a mottled appearance, not unlike marble. This eruption often vanishes suddenly, and again makes its appearance; occasionally before death it assumes a more permanent character; in other cases it amounts merely to an erysipelatous appearance, which, after remaining for a short time, disappears and does not return.

Russell has given in his history of the plague a series of tables

* It is very difficult to determine whether these maculæ or the carbuncle constituted the *plague token*. In the descriptions which the old authors give, they frequently name characters proper to both. As far as general description goes, we should have no hesitation in saying that the carbuncle was the true token. Thus they are described "as originating in little pyramidal protuberances, having the pestilential poison chiefly collected at their bases:" besides, they are spoken of as being surrounded by a blue or blackish circle, or putting out blisters. Yet at the same time the chief test of the token is said to be absence of pain even when pierced with a needle, which certainly is not the case with the carbuncle. The probability is, that the eruptions generally were viewed as the tokens of plague.

deduced from 2700 observations on plague cases, which show the relative frequency with which these several eruptions occur. From these tables it appears, that of the eruptions the inguinal buboes are the most common, exceeding the axillary by more than two-thirds, and exceeding the carbuncles in a still greater proportion. The parotids bear but a small proportion to the inguinal buboes, and are chiefly incident to children and to the youth of either sex. Spurious buboes are comparatively very rare. It further appears, that the simple inguinal bubo affects the right groin more than the left, in the proportion of 729 to 589; and that they occurred in both groins in one-eighth of the cases. Axillary buboes are also rather more frequent on the right side than on the left, but the difference is inconsiderable. Their occurrence in both sides is rare, for, in 358 cases, only nine instances were observed. Parotid buboes very rarely occur, unless complicated with other eruptions; and the carbuncles still more so, though these latter in combination with buboes are not unfrequent. The spurious bubo, which does not very often make its appearance, is met with as frequently by itself as in conjunction with other eruptions. The most frequent complications met with are carbuncles with buboes.

Bulard arranges the varieties of plague, and deduces his diagnosis, from the different complications of these eruptions. He says, that in all cases the following diagnostic symptoms occur, either singly or collectively:—

1. Knotty tumours of the lymphatics in the groins and axillæ, rarely in the neck, and still more rarely about the knee.
2. Petechiæ in the thorax, the neck, and sometimes over the whole surface of the body, rarely on the limbs.
3. Carbuncles in greatest number upon the limbs, but seldom upon their extremities, or upon the face, or trunk of the body.

During the prevalence of plague in 1834 at Cairo, and particularly at Smyrna, he states that these three morbid appearances have constantly indicated three different forms of disease:—The simple, where buboes alone occur; that in which buboes and petechiæ occur together; and that in which buboes and carbuncles are united. He has never observed the last two forms occurring together; that is, he has not met with cases in which there were at the same time buboes, carbuncles, and petechiæ conjoined.

We shall conclude this short description of the peculiar symptoms of the plague by a few observations on the state of the blood. This fluid, on being drawn from a vein, flows easily and in a continued stream. In the *Traité de la Peste* it is, however, described as a viscid semi-fluid substance, not springing out like healthy blood, but trickling slowly like muddy wine-lees or even

treacle. In no stage does it ever exhibit the buffy coat; nor, according to recent observers, is it ever of greater consistence than in health. It has a peculiar odour, and is of a dark red colour, which never changes, as is otherwise the case, into a bright red; on the contrary, after standing for a time, the general mass assumes the tint of a violet red, becomes cupped, and has a red-coloured serum floating in its concavity. Sometimes, however, it shows no disposition to form a coagulum, but remains quite fluid, of a livid colour, exhaling a strong odour, which appears to proceed from drops of an oily-looking fluid floating upon its surface. On analysis this blood has been found to contain in 100 parts the following ingredients:—

Coagulum,	Water	35·576
	Fibrin	·624
	Colouring matter, with some fibrin, albumen, and fatty matter	3·800
Serum,	Water	54·420
	Albumen and colouring matter	4·704
	Extractive matter	·252
	Chloride of potassium and sodium	·408
	Carbonate of soda and fatty matters	·216
	Sulphurous acid	traces.

After death the blood is found in the arteries in small quantities; it is as black as in the veins, fluid, and seemingly decomposed. In the large venous passages there is often found floating in it the oily looking substance, which is discharged with it during life.

II. VARIETIES.

Having now given a general outline of the more prominent and characteristic features of plague, we shall take a short review of the different forms in which this disease is found to occur. For the sake of brevity these may be referred to one of three divisions. 1. *Simple or glandular* plague; 2. *Eruptive* plague, attended by a period of reaction. 3. *Malignant* plague, in which the period of reaction is either entirely absent, or but very imperfectly developed.

1. The *simple* or *glandular* form of plague is rarely fatal in its termination, and but seldom characterized by any very urgent symptoms. Sometimes, indeed, it is so slight an affection, that only very modera'e, or even no febrile symptoms are developed. The patient may feel himself slightly indisposed for two or three days, but not to such an extent as to render confinement to bed, or even to the house, necessary. He is enabled to perform his ordinary oocupations unembarrassed by the very slight mental excitement and other symptoms that may be present. The

buboes, which are almost the only decisive evidence of the existence of plague, go on kindly and speedily to suppuration. Persons thus affected are often known to walk about and pursue their accustomed avocations apparently in good health, and without expressing any inconvenience from the buboes.

In other cases there is evidently a febrile excitement, which, though sufficiently well-marked, is neither of long duration, nor very urgent. For the first two or three days there are general nausea, loss of appetite, disinclination and some inability to use exertion; the skin is dry and hot, especially at night, with restlessness and some degree of excitement, which scarcely ever amounts to delirium. The pulse is accelerated, full, and bounding; there is urgent thirst; the eye, though bright, has not the singular glistening appearance that has been alluded to; nor has the countenance the bloated drunken character so generally seen in the severer forms of plague. After these febrile symptoms have continued for a few days, they subside upon a perspiration taking place; but, towards the evening of the day on which this may have occurred, they are renewed, to be again relieved by another perspiration towards morning. These nocturnal exacerbations and morning remissions often continue for a week, or even for fourteen days, before recovery may be said to be established. During this period the buboes pass through their several stages in a regular steady manner; they are attended with rather more pain than when the febrile symptoms are not so marked; if situated in the inguinal region, as they most generally are, they may from their locality so inconvenience the patient, as to prevent his walking, when such inconvenience would not be the consequence of the constitutional derangement simply. Occasionally, though not very frequently, carbuncles occur in the slighter form; they, however, quickly crust over, the crust soon separating by the kindly secretion of pus, the result of a healing process, which is quickly followed by the wound becoming sound.

2. The *eruptive* form of plague, attended by a period of reaction, is of more frequent occurrence than any of the other varieties. It includes, in fact, by far the greater proportion of cases that occur. Their ordinary history is, a febrile paroxysm at night of some severity, followed by a morning remission, which is preceded by a state of diaphoresis more or less marked. Towards mid-day an accession of febrile symptoms recurs, though not so intense as those of the previous night; these are again followed by a remission, which is likewise superseded by the more severe nocturnal paroxysm. This variety of plague is particularly distinguished from the other two, by the pulse being fuller; a character which it maintains in the early stage of the disease, and by the power of reaction when any unusual severity in the

form of the disease may have particularly depressed the system —a state which not unfrequently occurs at the commencement of the nocturnal exacerbation; in fact, all the symptoms point out, that this form is more inflammatory than the simple or glandular, and that the system is endued with greater power of resisting the malignant effects of the plague poison than the adynamic variety. It is also characterized by a tendency to critical perspirations on the third, fifth, seventh, or subsequent odd days.

The series of symptoms attending this form of plague may be stated to be as follows:—It commences in a well-marked though by no means severe feverish attack; there is some degree of restlessness, and an excited pulse, nausea and vomiting of bilious matter, with most probably the appearance of one or two buboes, and perhaps of carbuncle, of which there is often a succession as the disease progresses. Though the mind may, at the onset, be a little agitated, there is never delirium or coma. The symptoms sometimes assume a slight degree of intensity; but it is very remarkable, that whatever be their character, whether more or less severe, no judgment can be formed as to the future course of the disease; it is often found that the severest symptoms have supervened when the commencement has been mild; and at other times, when this first stage has been peculiarly violent, a mild form of plague has succeeded.

On the subsequent, that is, the second day, a remission in the symptoms usually takes place, sometimes attended by diaphoresis. The heat of the surface is moderated, the pulse abates in frequency and force, but does not acquire a character which can be called small. There is not, however, a perfect remission, much headache, pain in the buboes, and nausea, being felt; there is very rarely vomiting, for though this is a symptom which is pretty constant on the first day of attack, it rarely recurs afterwards. As the day advances, a return of the fever takes place; it is not, however, preceded by any rigor, nor indeed by the least sensation of chilliness. It is, in truth, scarcely to be called a paroxysm, but rather an increase of the febrile condition which prevails during the remission. The pulse rises, but remains soft; the heat of surface is moderate; the thirst urgent; the tongue moist; there is much restlessness, and the functions of the brain are evidently affected, shown by confusion of intellect or disposition to coma. Towards evening a partial perspiration breaks out, after which these symptoms abate considerably, the patient complaining of more general indisposition, anxiety about the præcordia, and feeling of oppression than during the morning remission. As night advances the true febrile paroxysm ensues: the patient becomes very restless, suffers from a sensation of intense heat, the skin being perceptible to the touch of a high temperature; the pulse is quick and

feeble; the eye muddy, and the countenance generally acquires the drunken expression so remarkable in plague; and, in addition to a state of the most distressing bodily weakness, there is transient incoherence alternating with coma.

As the morning of the third day advances, in the more favourable cases a profuse perspiration ensues, which is often critical, being followed by a marked remission, and immediate relief of the symptoms; the pulse becomes open, soft, and less frequent; the restlessness and thirst diminish; the intellect is more clear; and altogether there is a decided amendment. Towards mid-day there is slight febrile exacerbation, which, though somewhat severe, is by no means protracted, for after a very short time, a remission takes place; this continues till nightfall, when another exacerbation ensues, characterized by a greater power of resistance in the system than during the exacerbation of the previous night; the pulse is stronger and fuller, while the coma and wandering delirium abate. On the following morning (that is, the morning of the fourth day), the perspiration is not so copious, nor attended by so complete a remission as on the previous day; it does not, in fact, in any way come under the denomination of a critical sweat.

The exacerbation which takes place towards the middle of the day is moderate, while that which comes on at night is very severe, more so by far than the exacerbation of the previous night. On the morning of the fifth day another critical sweat breaks out; this is the commencement of a very decided remission, which is followed by an exacerbation in every respect milder than any that have preceded it. There is now evidently an abatement of the symptoms, and though they may continue somewhat in this order for a week longer, yet they daily decrease in intensity, so that, after the second week, their force has so far subsided that the patient may be declared to be in a state of convalescence. During this time the buboes run a steady course to suppuration, and the carbuncles form very early a crust, which is soon removed by the healthy granulations that ensue.

Such is a history of the more favourable cases of this form of plague. In those where the symptoms assume a more severe character, it is found that, on the third and fifth days, the critical perspirations either do not take place at all, or are but very imperfectly marked. Instead of the symptoms remitting, or the system showing powers of resistance adequate to repel the noxious influence of the disease, a more alarming state of things comes on, and the eruption of vibices and petechiæ is superadded to the buboes and carbuncles. As a general rule it may be said that, when buboes and carbuncles alone are present, a favourable termination may be anticipated; when buboes and petechiæ occur together, the result is generally unfavourable, especially if

there be superadded diarrhœa, hemorrhages, and loss of speech. It is, however, a very capricious disease; occasionally the most urgent symptoms, to all appearances, are followed by a favourable termination; while at other times, apparently the mildest cases are suddenly cut short by death. Not above one half of those affected with this form of plague recover.

We have previously alluded to the frequency of menorrhagia in plague, as well as to the fact that when pregnancy exists, abortion almost invariably takes place. Russell makes the very curious remark, that women, under these circumstances, generally die on the seventh day. He says, that he once met with an instance of a pregnant woman dying on the third day, but in general the seventh was the fatal period; some very rarely struggled on till the eleventh.

It may not be inapposite here briefly to sum up the characteristics of the two forms of this our second division of the disease.

The slighter has more the character of ordinary fever; the shivering and succeeding reaction are more marked, and the stomach is disordered to vomiting:—this condition, unattended with anything like coma, remains during the illness, the fever throughout the whole time never ceasing, though not unfrequently remitting. The buboes and carbuncles generally make their appearance on the first day and pass on kindly through their various stages. Generally speaking, the third morning is critical: if a remission of the general febrile symptoms ensue, with free perspiration, a favourable termination may be expected; if, however, this should not be the case, but the skin hot and dry, with drowsiness, low muttering delirium, quick, small pulse, muddy glistening eye, and considerable jactitation, danger is to be anticipated: this condition, however, may continue for a fortnight before the patient sinks.

The severer form, which is much more fatal, begins generally with a slight shivering and sense of cold, and is soon succeeded by the usual symptoms of fever, accompanied by vomiting and purging. The fever increasing towards night, the face becomes flushed, the eyes glisten, and the patient is either delirious, or more or less comatose. During the succeeding days, at every exacerbation, these symptoms increase; the pulse becomes rapid and more or less full; the eyes have the peculiar and characteristic muddy appearance; there is a confused expression of countenance, with pain, heat, and oppression about the præcordia. From three to six days is the period in which these symptoms run their course. The buboes do not in general make their appearance until the second day, and but rarely suppurate; experience has shown, however, that they do not influence the termination of this form of plague, for, even if they do suppurate, few so affected recover.

3. The third and last division of plague, which may be denominated the *malignant*, and in which the period of reaction is either entirely absent or but very imperfectly developed, usually sets in with chilliness, vomiting, sudden loss of strength, headache, confusion of ideas, giddiness, and oppression of spirits; death sometimes takes place rapidly, occasionally within the short space of twenty hours, and even before decided characters of dangerous illness are apparent; for, if the febrile symptoms are but slightly developed, the disease may be considered to have assumed its worst character. In this rapid form, death ensues before buboes or carbuncles appear. In other cases there are, for a few hours, some symptoms of reaction, and signs of more general disorder become evident. This usually occurs towards night. The eyes lose their lustre, become muddy, staring, and excited; the expression of the countenance is haggard; in some, immediately before the accession of the more violent symptoms, it assumes an appearance of despair and horror, which baffles all description, but can never be mistaken by those who have once seen it; much distress is felt not only in the cardiac and præcordial regions, but in the heart itself, which is much aggravated by the vomiting that is often constant; the thirst is urgent, but the tongue is moist. The pulse, though often natural, is for the most part soft and quick, though it occasionally acquires some degree of strength and fullness; this, however, is very rare. The skin remains cold, or if it acquire any increase of temperature, it is but for a short time, flushings of heat passing partially over the surface; the power of utterance is lost or very much impaired; the patient is generally in a low, drowsy, lethargic state, but conscious, when roused, though there is a disinclination to be disturbed. Occasionally this state is disturbed by transient fits of delirium. It is in fact, sufficiently evident, that the brain and nervous system are seriously affected. Towards morning the symptoms abate, and the unsteadiness of mind is greatly recovered from; at any rate, in the majority of cases, attacks of delirium no longer occur. Russell says, that when patients had been delirious in the night, they usually recovered their senses in the morning, though sometimes disposed to ramble a little and talk incoherently, and did not lose them again in the subsequent exacerbations through the day. This comparative abatement in the severity of the symptoms which takes place during the day, scarcely deserves the name of a remission, so frequently is it disturbed by slight increase in the febrile tendency. Amid these very perceptible exacerbations, there does not appear to be left in the system stamina adequate to overcome the depressed state of the vital powers. The surface continues low in temperature; the pulse small, equal, and quick, occasionally fluttering; the speech falters; the tongue is white and moist; and the thirst has abated. Towards night, however, the

symptoms become much more alarming, and are altogether indicative of an oppressed condition; the eyes again become muddy; the countenance is bloated and swollen; the anguish at the heart and epigastrium increases; and the restlessness is incessant; the pulse is small, quick, and unsteady; the thirst urgent; the tongue dry; the articulation very indistinct; delirium, or in the worst cases coma, comes on; and occasionally there is vomiting, or purging, or both, either of which adds much to the general distress and hastens the termination of the disease. Towards morning a calm ensues, which is occasionally accompanied by perspiration. Those who are not accustomed to this form of the disease, are very apt to argue favourably from this event. It is, however, entirely fallacious. The quiet condition in which the patient lies is rather attributable to exhaustion from the excessive restlessness and febrile state of the previous night, than to any real abatement of the disease. During the day many exacerbations of febrile action take place; but these are so slight and so little marked from the weak and sinking state in which the patient is, that, without the minutest observation, their presence might not be perceived. Towards night death often takes place, though occasionally the patient survives in a low typhoid delirious condition, in which there are much drowsiness and alarming prostration, the body being covered by petechiæ and vibices, while buboes and other characteristics common to putrid disease, but very rarely carbuncles, make their appearance. When buboes are present they are not usually observable before the second day, generally on the third, are attended by little pain, and never pass into suppuration. The course of this form of plague is not apparently influenced by the appearance, or by the progress of the buboes. When carbuncles occur, which, as we observed, is very rarely the case, crusts form round the edges, of which a little matter is secreted, but never to such an extent as to facilitate the separation of the crusts; sometimes they remain dry and shriveled. Very few, indeed, it may be said none, of those who are attacked by this form of plague recover. They usually die, as is observed in the severer cases, on the first or third days, and but rarely survive the fifth.

III. SEQUELÆ AND COMPLICATIONS.

The consequences of plague are not very numerous. The period to which the fatal termination is postponed, varies according to the nature of the disease and the constitution of the patient. Occasionally, when the specific influence which causes plague is in its greatest intensity, the system yields to it, and sinks without a struggle, a few hours only intervening after the first symptoms have appeared. These rapid and malignant cases are usually

met with at the very commencement of the epidemic; afterwards cases are frequent in which the patient lingers till the seventeenth or twentieth day. Death ensues, sometimes as the result, as it were, of pure exhaustion; sometimes as the consequence of syncope; at other times it occurs from a convulsion, or a sort of apoplectic seizure. When recovery takes place, the convalescence which immediately follows on the cessation of the more severe symptoms, though not very protracted, is yet generally attended by a slight febricula; this, in fact, continues until the complete healing of the buboes has taken place, when there remain scars which are never obliterated.

A very curious consequence of recovery from plague, which has been much dwelt on by some writers, is a tendency to lewdness and incontinence. The degree of frenzy and bestiality which has attended this disposition has, in some instances, been excessive: with the exception of these, authors have not particularly mentioned any very marked local or functional disorders as sequelæ of plague; nor do they mention that it is complicated with, or modified by, other diseases. We may therefore conclude, either that they do not take place, or, if they do, that the symptoms of plague are so prominent as to obscure them. Although these complications are not spoken of, yet many observers state the very remarkable fact, that open wounds apparently afford protection against an attack of plague. As early as the time of Galen the observation was made, that, while the disease was raging on all sides, those having running issues were not affected. The same fact has been observed by many modern writers; Desgennetes observes, that "wounded men enjoyed an immunity so long as their wounds were in a state of excessive suppuration, but which they lost when their sores healed." Some of the older writers, with Sydenham and Heberden, mention plague as preceded by, and in the first instances complicated with, a very fatal form of spotted fever.—There can be no doubt, from the light thrown on this subject by the more extensive observations of some modern writers, that these were really cases of plague, but not characterized by the formation of the bubo.

IV. ANATOMICAL CHARACTERS.

Until within the last few years the knowledge of the lesions which take place in plague was very limited; for not only was there an overwhelming feeling of the danger of such examinations, but the prejudices of the countries in which this disease most usually occurs were opposed, under any circumstances, to such investigations. In more recent times, however, these feelings and difficulties have been overcome: and the researches

which have been made by Frank, Chicoyneau, Verny, Fonillier, Deidier, and more especially Bulard and Clot Bey, furnish us with very extensive details of the morbid states observable after death. Before describing these, however, it must be borne in mind, that no very great extent of morbid lesion is to be seen in the most malignant forms, but rather in those where the disease has been protracted. It may, in fact, be stated, that the number and intensity of the organic changes observable, are in an inverse ratio to the intensity of the disease. With this explanation we shall now proceed to state the appearances which have been noticed on dissection.

Externally on the neck and upper part of the chest, on the limbs and about the external organs of generation, distinct petechiæ, large vibices, and extensive masses of discoloured integument, are in most instances observed. These appearances have generally been assumed as indicative of a very putrid state of the body; but there is really in the bodies of those dying of plague, no particular tendency to rapid decomposition. Besides the eruptions now described, there are usually many carbuncles in different stages and forms scattered over the person, together with buboes in the groins and arm-pits, and occasionally, though very rarely, in the neck. According to Clot Bey, wherever buboes had not made their appearance, the lymphatic glands generally were enlarged. The subcutaneous veins are not distended to an extent to be externally apparent. The expression of the countenance is sunken and collapsed, having entirely lost the bloated and livid aspect which it presented shortly before death. The eyelids are closed, the mouth is open and covered, as well as the nose, with sordes, and the dark-coloured matter which has been vomited. There is a general impression, that the countenances of those dying of plague are peculiarly deformed; but this does not really appear to be the case; indeed, Clot Bey says decidedly, that "the corpses have not the hideous aspect which physicians have described, and artists painted."

The muscles never acquire that perfect rigidity which is usually consequent on death. Their softness and want of cohesion in the fibre evidently show that a considerable deficiency of tone had taken place throughout the whole muscular tissue during the progress of the disease. In colour they appeared to be somewhat livid, presenting here and there characters of a more localized inflammation.

In the cavity of the cranium, with the exception of some little fullness of the vessels, no very particular morbid appearances have been observed. The brain itself, in some few cases, may be said to be generally softer than is usual, and there may be rather an injected appearance in its medullary portion, as well as a

lighter colour than natural of its cineritious substance. The sinuses of the dura mater, together with its vessels, are certainly distended, but the dura mater itself, and the other investing membranes of the brain, show no signs whatever of inflammation, nor is there otherwise any trace of disease in them. The choroid plexus is not unduly injected, nor is there any morbid increase of fluid in the ventricles. Bulard says, that "the sympathetic nerve is neither red nor softened; its ganglia are always healthy; and it is only in some rare cases that petechiæ, or rather an exudation of blood, have been seen on it in the lower part of the chest; when closely examined, these specks are found to be only of the thickness of the neurilemma, and do not pervade the tissue of the nerve." The neurilemma also undergoes a remarkable change in size, where the nerves are included in knotty swellings of the lymphatics. When these swellings are much developed, and when there is much blood in the part, then the outer surface of the neurilemma is observed to be freely covered with these specks; but on a slight incision, and a careful dissection being made, it may easily be seen that they are confined to the external layer of the neurilemma and to the cellular tissue surrounding it. The different plexuses of nerves, and particularly the solar, are without any appreciable alteration.

The diaphragm has, in one or two instances, been found inflamed, and to have petechiæ scattered over its surface. Generally speaking, the state of the lungs presents nothing unusual; sometimes they are slightly engorged; and cases are mentioned, where an inflammatory appearance has been observed. Dr. Craigie, however, describes the lungs to be of a deep black or livid colour, with their vessels distended by a thick dark-coloured blood, and their substances softened, in some instances chequered by livid stripes or patches, generally swelled or enlarged, so as to protrude the heart and project occasionally from the chest. The changes in the circulating system are extensive and important. The pericardium rarely presents externally any particularly diseased appearance, with the exception of its being distended. Internally, both where it is free and where it covers the heart, petechiæ in distinct spots are occasionally met with; usually its cavity contains rather a larger quantity of fluid than is natural. This fluid is of a bloody colour—a fact which Baron Larrey, in his *Memoirs of Military Surgery*, particularly dwells on. The heart itself is almost invariably found flabby and enlarged; it is said to be generally one-third larger, and Clot Bey even speaks of its being twice the natural size; its fibre is pale and softened. The system connected with the venous circulation appears to be especially disordered. The orifice of the right ventricle is usually dilated, as well as the ventricle itself, which contains a quantity of black

fluid blood surrounding a mass of fibrin. The whole system appears overloaded and distended, at least this is evidently the condition of the venæ portæ and larger veins, which are in many places discoloured and obviously diseased. The blood which they contain is fibrinous, and of a dark colour, with oily-looking particles, resembling greasy soup, floating on its surface. Occasionally it has been observed to be unduly liquid, inflammatory, and sizy. (*Relation Historique de la Peste de Marseille.*) The arteries are for the most part empty, and to all appearances healthy, excepting in some rare cases where a few livid spots are scattered over their external coat. These are not of so defined and decided a character as to warrant their being termed petechiæ, though doubtless they are of the same origin and character.

The digestive organs, in many respects, show evidence of very considerable disease. There is almost always general softening of the membranes, which compose the alimentary canal; the serous muscular, or mucous membranes of which appear to be so degenerated in their structure, that they are torn with the slightest force. The stomach internally is covered over with slimy yellowish mucus, (Savaresi, *Histoire Médicale de l'Armée d'Orient,*) and contains a quantity of a dark-coloured fluid; at times this fluid is almost black, and, on analysis, (*Wochenschrift für die gesammte Heilkunde*, No. xlii.,) has yielded in 100 parts—

Water - - - - - -	95·75
Oxide of iron - - - - -	·25
Resin - - - - - -	1·75
Mucus and fat - - - - -	·25
Albumen with colouring matter - - -	2·00

The authors of the *Relation Historique de la Peste de Marseille*, state, that in many of those who died during the pestilence which raged there in 1720, the bodies which they examined presented no particular appearances of disease, with the exception of slight traces of inflammation perceptible in the mucous membrane of the intestines. Recent investigation has, however, shown, that on washing away the slimy yellow mucus from the stomach, its mucous surface is covered in many places with very distinct petechiæ, varying according to Bulard, as in the skin, in colour and size. They sometimes run together, so as to form a continuous bluish-red surface, of a very characteristic appearance, and which can in no way be confounded with the appearances of the inflammatory stage of acute gastro-enteritis. Occasionally, in some very protracted cases, ulcerations are observable among the rugæ; seldom, however, towards the cardiac orifice. These ulcerations generally appear across the lines of the rugæ, sometimes they are situated longitudinally in the folds. They never appear to be very deep, or to affect any other than the mucous membrane. The appearances that these ulcerations present are, small defined

circles of a reddish liver colour, surrounding an abraded surface, in the centre of which is seen a small dark spot, evidently gangrenous.

The small intestines are generally distended. Externally, with the exception of the softening of their coats and a slight yellowish tinge, there are no evidences of alteration of structure. Internally, there is frequently a small quantity of a dark-coloured fluid, not dissimilar to that found in the stomach, the mucous surface being covered with numerous petechiæ, smaller and more distant than those in the stomach, and here and there are extended spots of one or two inches in length, of a red colour, as well as streaks resembling ecchymosis. The ilio-cæcal valve and the appendix vermiformis are often discoloured and of a livid hue. The latter is sometimes very much enlarged, even in some cases to three times its usual size. The large intestines are rarely diseased. The liver is perfectly natural as far as regards shape and size; sometimes, however, a few petechiæ may be met with upon its external surface, and occasionally, but the cases are very rare, the border of the left lobe is occupied by carbuncular inflammation. On cutting into its substance, it is found gorged with blood, but not to any greater extent than might have been expected from the loaded state of the venæ portæ and the venous system generally. The gall-bladder, to all appearances, is distended, and its sides are thickened, and have somewhat of a bluish tinge. The quantity of bile which it contains is, nevertheless, not very considerable; it is of the ordinary dark-greenish colour, and of the usual consistence; sometimes, according to Larrey, (*Memoirs of Military Surgery*,) it is very fetid. Diedier (*Dissertation sur la Contagion de la Peste*) says, that "in many of those who died at Marseilles, during the time that the plague raged there in 1720, the gall-bladder was found to be extremely loaded with black or greenish bile." Of all the viscera the spleen is the most frequently altered in structure; it is frequently considerably enlarged. Its external covering is usually softened and covered with petechiæ: internally its parenchyma is broken down, presenting the appearance of grumous blood.

The pancreas has been found in some few cases slightly hardened and enlarged, but this lesion is so rarely observed, that it can scarcely be said to be proper to plague. The kidneys are usually increased in bulk, varying from the least perceptible increase to three times their ordinary size. Their external surface is not unfrequently spotted with petechiæ, which from running together, give the appearance of ecchymosis. The structure of the interior of the kidney is not materially altered, excepting that it is softer and more easily torn. It is overcharged both in its cortical and tubular structure with a black fluid blood. Clot Bey describes

it as of a deep violet colour, gorged with blood, and to have a true hemorrhage into the pelvis. The ureter also partakes somewhat of disease, for, generally speaking, extensive ecchymoses are found to have taken place beneath its external coat. The bladder is but very rarely affected, but is generally found to contain a quantity of urine, deeply tinged with blood. In very severe and protracted cases, however, its mucous membrane may be covered with patches of mucus, and occasionally spotted with petechiæ.

When the glands (chiefly the inguinal and axillary) are diseased, they are enlarged, and covered with bruised-like integument. On cutting into them there is much sanguineous effusion in their immediate neighbourhood; and surrounding and connected with them are knotted masses of lymphatic tissue, as well as portions of cellular membrane, the inflammation and enlargement of which form small tumours. The diseased glands are found varying from their natural size to that of a large egg, ranging in colour from a gray to the deepest livid, and in point of hardness from that of a scirrhus to fluid softness. When cut into, this is immediately explained, by their presenting every condition from the earliest stage of inflammation to that of suppuration. Clot Bey (*Brit. and For. Med. Rev.*, vol. i. p. 248), says, that "the lymphatic glands are always gorged, sometimes increased five or six times, softened, and of a colour like lees of wine, and sometimes black; those of the groin or arm-pit, by their agglomeration, form a homogeneous mass, of a colour almost always like lees of wine, with effusion of black blood into the surrounding cellular tissue. A similar change may be seen in the chain of glands along the vessels of the abdomen and chest; and in many cases the extravasation of blood around them amounts to hemorrhage."

Such may be considered as the more ordinary lesions which take place in plague. The last that have been now described, namely, those of the lymphatic system, Bulard views as primary, they being the essential lesions of the disease; while he regards the others as secondary, and the consequence of diseased actions originating in the primary lymphatic affection.

V. DIAGNOSIS.

A few words only need be said on the diagnosis of plague. This disease, for the most part, is not likely to be confounded with any other. Its symptoms are usually so well marked, that in those cases which run a complete course, no hesitation need be felt in deciding on its identity. The intense fever, the staggering gait, and the eruption of the buboes, &c., sufficiently indicate its

presence. Under two conditions, however, some little difficulty may occur. The first is to distinguish it from a low typhoid fever, when the eruptive symptoms have not shown themselves; and, in the other case, it may be mistaken for syphilis when inguinal bubo without concomitant fever appears.

In the former case the peculiar expression of the eyes, the enlarged tongue, and the difficult articulation, are indications sufficiently distinct of its being the true plague; while, in the latter, the lower situation in the thigh of the glandular swelling than is usual in syphilitic irritation, forms in some measure a characteristic difference. In this latter case, however, the diagnosis must be chiefly formed, not on the intrinsic merit of any particular symptom or appearance, but on the epidemic concurrence of the plague at the time in other persons.

VI. PROGNOSIS.

From the history which has now been given, the value of many of the phenomena of the disease, as indicative of the subsequent course which any individual case may take, can in some measure be appreciated. It will, not, however, be unprofitable to bring together those characters of the disease from which a prognosis is chiefly formed. Generally speaking it may be said, that those cases are peculiarly favourable in which buboes arise early, and go on rapidly through their several stages to a kindly suppuration, especially if there be an absence of any very marked fever, or if there be no or very little vomiting, or if the respiration do not correspond with the smallness of the pulse. The condition of a bubo is favourable when, at its commencement, it is firm and unyielding to the touch, is not generally adherent, and easily movable at its base. In case of fever being a concomitant, it is always favourable if there be a copious eruption of buboes only, or of carbuncles in great numbers, and with broad surfaces, and if the fever itself be open, nor, during its course, attended by much cerebral disturbance, but more especially if it subside after a gentle perspiration, or even the critical sweat of the third and fifth days. The case is always to be judged of favourably, if the patient survive to the eighth day, as this argues a state of constitution which is superior to the influence of the disease: moreover, during so protracted a period there are ever symptoms of reaction which give great chance of hope that a crisis may occur. This period, however, generally takes place about the commencement of the second stage, and is marked by the very perceptible lessening of the restless and excitable state of the patient, by the buboes enlarging, becoming softer, and passing into suppuration: by the sudden appearance of several carbuncles with broad bases,

sometimes so large as to be five inches in extent: this condition is sometimes accompanied with a papular and vesicular eruption of boils and large red blotches, or a tendency to hemorrhage from the nose, and in females from the vagina. The pulse is almost natural, not exceeding seventy-five, soft, and open; the skin, which previously was harsh and dry, becomes soft and bedewed with moisture; the tongue loses its sooty coat, which cracks, becomes moist, and peels off; the expression of the eye becomes natural, the pupil being no longer dilated nor the conjunctiva injected: indeed, the whole condition of the patient shows an amelioration in the symptoms, which, going on favourably, end in recovery.

The circumstances which indicate a fatal termination are, at the commencement, a suddenly depressed state of the system unfollowed by any reactive power, but more especially when accompanied by no eruption of buboes: if, however, any of the febrile eruptions do take place, and there is also delirium together with excessive cardialgic pains, the prognosis is bad; but should these symptoms not manifest themselves until the second day, they are not to be judged of so unfavourably: if the disease go on in its course without any excessive fever or cerebral derangement, and without evincing any tendency to glandular enlargement, but in place of them petechiæ or carbuncles make their appearance, an unfavourable termination may be anticipated—the occurrence of petechiæ and carbuncles, as evidence of a gangrenous character, is to be regarded as unfavourable, especially if these eruptions occur in great abundance. The other circumstances which most manifestly denote an untoward termination are, a general aspect of malignity, as evidenced in a low putrid condition of the system, the non-appearance of matutinal moisture, urgent pains about the heart, a drunken expression of the countenance, the muddy eye, colliquative diarrhœa, severe vomiting, hemorrhages from the mucous surfaces that are constant and not critical, hiccough, coma, low muttering delirium, and the sudden clearing up of the mental faculties after a period of violent excitement.

VII. STATISTICS.

The statistics of plague show that it has been at all times attended with the greatest mortality. When this disease raged throughout Europe, betwen the years 1347 and 1350, it has been computed that a fourth part of the inhabitants of this part of the globe were carried off. During the prevalence of this pestilence, which has been emphatically called the Black Death of the fourteenth century, Hecker says that, without exaggeration, Europe lost 25,000,000 of inhabitants. During the time that the plague

raged at Marseilles, in 1720, it is recorded that in the Hôpital de la Charité there were admitted from the 3d of October to the end of February, 1013; and that of these 585 died; and during the same period, in the Hôpital du Jeu de Mail, from October to the 3d of July, 1512 were admitted, of whom 820 died. These numbers, however, give a higher rate of mortality than the returns of the disease rendered in the town generally; this might naturally be expected, as only the severer cases would be removed to the hospitals. The population of Marseilles, previous to the occurrence of the disease, was calculated to be about 90,000, of these 40,000 died, 10,000 only of the whole population not having been in any way affected; so that it gives the enormous mortality of fifty per cent. of those who were attacked by plague. M. Gerardin (*Mém. de l'Acad. Roy. de Méd.*, tom. vi.,) gives a very extended notice of the plague as it raged in Moscow, in the year 1771; in the course of this he quotes from Orræus a table of the deaths during the plague year, 1771. In April there were 744; in May, 851; in June, 1099; in July, 1708; in August, 7268; in September, 21,401; in October, 17,561; in November, 5235; in December, 805; making a total in nine months of 56,772. It is probable, however, that the mortality was even greater than is here stated, as many dead bodies were afterwards found in houses and concealed places, of which no report was given, and consequently were not included in the report. (*Edin. Med. and Surg. Journ.*, vol. xlix., p. 242.) In the returns made to the senate and council of health, the number of deaths by plague exceeded 70,000, according to De Mertens, and if to these be added the number of those privately and secretly buried, he thinks it cannot be under 80,000. But the fatal effects of this epidemic may be better appreciated from the following facts:—Between December, 1770, and March, 1771, when the great influx of strangers and inhabitants takes place, it was calculated that the population amounted to 250,000, and, according to some, 300,000. As they begin in March to return to the country, it is supposed that at least one-fourth of the inhabitants must be absent during the summer season. During the summer of 1771, the apprehension of the plague had driven so many from the city, that it is believed by De Mertens that in the month of August not more than 150,000 remained at Moscow. Allowing, therefore, that of this number 80,000 were cut off by the disease, it appears that the mortality was at least 53⅓ per cent., or considerably more than half of the whole population. M. Gerardin estimates the number destroyed by the epidemic to have been 60,000 only; but, according to various documents and considerations, it is placed as high as 80,000 by De Mertens, who, being upon the spot, had good means of information. It is remarkable that neither De Mertens, Orræus, Samoilowitz,

nor M. Gerardin, in their eagerness to furnish the amount of mortality, give us any information on the number of recoveries; being thus left completely in the dark as to the relation of the mortality to the numbers attacked by the disease, we are left to infer that few or none survived the attack of the epidemic. Jackson, in his description of the plague (*Account of the Empire of Morocco*) in the empire of Morocco, during the year 1779, mentions the instance of the small village of Diabet, in which 100 persons fell victims to the plague out of 133, the original population of the village before the visitation of the plague. He further says, that "many similar circumstances might be adduced relative to the numerous and populous villages dispersed through the extensive shelluh province of Haha, all which shared a similar or worse fate." Traveling through this province shortly after the plague had exhausted itself, he saw many uninhabited ruins, which he before had witnessed to be flourishing villages. On making inquiry concerning the population of these dismal remains, he was informed that, in one village which had contained 600 inhabitants, four persons only had escaped the ravage. Other villages which had contained 400 or 500, had only seven or eight survivors left to relate the calamities they had suffered. The destruction in the province of Suse was considerably greater than elsewhere; Terodant lost, when the infection was at its height, about 800 each day; the ruined but still extensive city of Morocco lost 1000 each day; the populous cities of Old and New Fez, 1200 or 1500; insomuch that, in these extensive cities, the mortality was so great that the living had not time to bury the dead.

We shall conclude this division of our subject by quoting the following table of mortality, from the effects of plague on the population of Smyrna for five months in 1834:—

ABSOLUTE NUMBER.				COMPARATIVE NUMBER.		
In proportion.	Cases.	Died.	Cured.	Cases Prop.	Mort. Cases.	Mort. Pop.
Turks, - 58,000	4500	4000	500	1 : 13	8 : 9	1 : 14⅕
Greeks, - 48,000	600	450	150	1 : 80	3 : 4	1 : 106
Catholics, - 10,000	50	30	20	1 : 200	3 : 5	1 : 333
Jews, - 8,000	457	297	160	1 : 18	2 : 3	1 : 27
Armenians, 6,000	120	54	77	1 : 50	3 : 7	1 : 111
Total, 130,000	5727	4831	907	1 : 22⅘	4 : 5	1 : 26½

The singular excess of mortality which the above table shows to have taken place amongst the Turks is attributed by Bulard to

their non-attendance to the prophylactic measures, which are resorted to by other sects living in the East.

Mortality, however, in plague, is influenced very considerably by many circumstances, as age, profession, climate, &c.

Infants, when born of parents suffering under the influence of plague, have occasionally on their person some marks of the disease. These are never known to survive; nor, indeed, do they, when born under such circumstances, though they have apparently none of the usual plague eruptions about them. It has been commonly observed that the young, healthy, and robust, are the most susceptible of plague influence, then women and children, and, least of all, thin, sickly, emaciated, old men. We have already alluded to the tendency which women have to excessive and unusual uterine discharge, and in case of pregnancy to premature labour. This, provided the symptoms assume a putrid character, adds very considerably to the danger of their situation; otherwise, the flux of blood is often attended by beneficial results. Dr. Brown does not, however, view this as a critical discharge, but as an evidence of returning health. Notwithstanding this chance against the adult female, observation has shown that in them, as is the case in children and sickly old men, the liability to perish under the poisonous influence of the disease is not so great as in robust adult men. Bulard, however, says, that "sex produces no marked difference."

Occupation, as may naturally be supposed, influences somewhat the liability to the disease. Generally those whose labour exposes them to mid-day heats, under circumstances of privation, are particularly susceptible. Russell says, that bakers are very liable to it, and that they have been observed to suffer in a remarkable proportion; and suggests, that as the loss of these people during a pestilence is most serious, their safety should be particularly looked to. In the historical account of plague as it occurred at Marseilles, we find the following summary of mortality in different trades:—"Of 100 manufacturing hatters, there died 53; of 134 house-carpenters, 84; of 138 tailors, 78; of 200 shoemakers, 110; of 400 cobblers, 50; and of 500 masons, 350; of persons in a still lower station of life, such as porters and chairmen, the mortality was very great indeed; scarcely a sixth part remaining at the close of the epidemic."

Situation, climate, and season of the year, there can be no doubt, are very essential elements in the production of the peculiar virus which originates plague. Though it may be impossible for us to explain how this may be, yet the recorded facts of many centuries offer evidence short only of the most positive proof. In respect to situation and climate, it has long been observed, that certain localities in the East, as Constantinople, Smyrna, Cairo,

and the towns towards the Mouths of the Nile, are most frequently prone to be ravaged by it; and that it occurs in these places, not only with epidemical severity in certain seasons, which experience has shown are the more congenial to the spread of its morbific powers, but that they are rarely found to be without some few cases which sporadically occur. In fact Abbot, Pruner, and Gregson (Holroyd's *Letter on the Quarantine Laws*), state that they believe Egypt never to be free from it; nor that it ever will be entirely so, as long as the conditions, which now predominate in the climatical exposition and in its interior disposition, continue. Though there may, from certain circumstances, be every reason to suppose that these situations and the climates proper to them possess the generating powers requisite to originate the disease, yet, at the same time, other circumstances occasionally occur, which militate against its either being exclusively owing to one or to the other, as is clearly evidenced by the occasional occurrence of plague in other and more distant places, and which appear in no respect to have anything in common with the eastern districts. A very extended observation would appear, however, to warrant the conclusion, that plague can arise in no other portion of the globe than that which is included between the tropic of cancer and the sixtieth degree of north latitude. Season of the year has, in like manner, a general influence, both upon the origin and progress of this disease; but there are also exceptions to its exerting any exclusive power. The common impression in the East is, that plague is arrested in its course by excessive degrees, either of heat or cold, and that an intermediate temperature favours its spread. Sir Gilbert Blane (*Select Dissertations*) says, "the experience of ages has incontestably established it, that the disease of the plague cannot co-exist with a heat of atmosphere above 80°, nor a little below 60°." This idea has been formed, and very justly so, on the fact, that in the East the plague, which usually commences in the spring of the year, subsides on the advent of summer; while in Europe it usually occurs at the commencement of, and continues through the summer, but subsides as winter advances; thus, towards the end of September, but still more sensibly in the second week of October, the plague, when occurring in London, has usually been observed to decline; and its decrease in November has been always rapid. This has been the ordinary tenour of its course, from which it has rarely deviated more than a few days. (Russell, *op. cit.*) Though this is what ordinarily takes place, yet now and then circumstances occur, which at once destroy any positive conclusions upon the subject; for instance, in 1813 it raged in Malta during the summer, and in Corfu during the winter; similar anomalies were observed in

England during its prevalence in the early part of the seventeenth century.

The decrease of plague in the East towards the middle of June is so remarkable, that, at Cairo, St. John's Day, which is the 24th of June, is ever understood amongst the superstitious inhabitants of these districts to put a period to the disease. The uniformity of its decrease as the summer advances is so very marked, that those persons who have previously confined themselves invariably on this day come forth, mix with other people, transact their ordinary affairs, and in no respect restrain themselves on account of any fear of taking the disease. It is generally supposed throughout Egypt that the heavy nycta, or mildews, which begin to fall about this period of the year, form the condition upon which depends the arresting the progress of the disease. There has been, however, no corroborative fact noticed, which enables us to infer that any condition of dryness, or of moisture, possesses this peculiar influence upon the disease. Gregory says, that "it is a common remark in the Levant, that the advances of the plague are always from south to north; and that, when plague is at Smyrna, the inhabitants of Aleppo handle goods without precaution, and have no fears of contagion; when the disease, on the other hand, is at Damascus, great precautions are observed, and all the Frank families hold themselves in readiness to *shut up*, or to leave the town."

Plague usually lasts as an epidemic for the space of three or four months. In the East, from whence the history is best filled up, it usually commences about March, by a few solitary cases of the utmost severity: the great mortality then commences, and is maintained with fluctuating variations until the period of its decline. This is sometimes remarkably sudden. Such a progress marked its occurrence at Marseilles in 1720. It is described as having advanced rapidly in August, raged through that month and September, and that its decline in October was almost as sudden as its commencement had been in August. This mode of its ceasing appears to obtain in all places, whatever may have been its duration, or whatever may have been the means employed against it, whether precautionary or curative. During the progress of the epidemic, there are evidently three periods in the course of which the mortality very considerably varies. At its commencement the disease is not very widely disseminated, but its relative mortality is greatest; as it arrives at its height the population is more universally infected, but the relative number of deaths is very materially diminished; and at its decline both the number of cases and the relative mortality are decreased to a sudden and remarkable extent.

It has generally been supposed that animals are earlier suscep-

tible of the influences which produce plague than man. This belief is grounded on the fact that, previous to this disease becoming epidemic, epizootic affections have been observed almost universally to attack cattle, under the effects of which great numbers of them perish; that birds desert the spot; that insects become more numerous; and that frogs are more vociferous. On some of these points there are the most decided and incontestable evidences. Hodges mentions the mortality of cattle in London, previous to the plague of 1565, as being very considerable. The medical faculty of Paris, during the prevalence of the black death in the fourteenth century, were commissioned to deliver their opinion on its causes. In this document they mention great mortality amongst fish; but the most distinct and valuable testimony upon this point is that of Dr. Gregson, (Holroyd's *Letter.*) He says, before the disease broke out, (1835,) a number of the Pacha's oxen were seized with a malady of which above one hundred died in a few days, and that he was sent to investigate and report on this epidemic. On examination he found gastritis and enteritis in the most intense degree, to such an extent, indeed, that he met with extensive gangrene in oxen, which had been observed ill but twelve hours. They also had large buboes. This he reported to be plague, and caused them to be interred deeply. Of animals dying during the prevalence of plague, there are numerous instances on record. Boccacio, who has given by no means the least instructive history of the epidemic of the fourteenth century, alludes to the mortality amongst animals, and details his having seen two hogs affected by it, which, after staggering about for a short time, fell down dead, as if they had taken poison. Hecker observes, that "in other places multitudes of dogs, cats, fowls, and other animals, fell victims to the contagion." Bulard inserted the serum from the carbuncles, and the pus from the buboes, and the blood from the heart and veins, &c., of those infected, into the subcutaneous cellular tissue of dogs and other animals; he also caused them to eat the same pathological products, but never succeeded in thus communicating the disease.

VIII. NATURE OF PLAGUE.

The phenomena attending the development of plague during life, and the lesions observed after death, do not enable us satisfactorily to decide upon its proximate cause or nature. Those writers who have entertained theories upon fevers generally, apply them most complacently to plague; and without much effort, but some little ambiguity, reconcile all that takes place to their favourite views. We shall not, however, dwell upon the

"considerable spasm and loss of tone in the extreme vessels" of Cullen; nor upon the gastro-enteritis of Broussais, the frequent absence of which, even to the period of death, he explains by saying it has not had time to develop itself; nor to the equally puerile views of another pathologist, who states plague to be an inflammation of the bronchial tubes—comparatively speaking, a very rare seat of lesion in this disease; nor upon several others which might be named, but content ourselves by giving a short abstract of the opinions entertained by Craigie and Bulard. The former of these writers applies the general view which he advocates, namely, that it is owing to derangement of the capillary system. In reference to the disease now under consideration, he says, that "the remote material agent which causes it, whatever that may be, acts upon the capillary vessels immediately or secondarily through their contents, in every tissue and every organ of the human body. The result of which is, that the fluids are no longer freely transmitted through them, so that there is produced a sudden and almost immediate retardation of the motion of the blood through the capillaries of the whole system." He infers this to be the case from the four following circumstances:—"1st. That the arteries of the brain and its investments, of the stomach, of the intestinal tube, and of the secreting glands, are distended with dark-coloured semi-fluid blood; 2dly. Because the vessels of all the organs are much loaded with dark-coloured fluid blood, which escapes immediately on the smallest incisions; 3dly. Because in several of the organs, for instance the brain, the lungs, the liver, the kidneys, and other solid organs, nay, even in the muscles, dark-coloured half-coagulated blood is found fixed in clusters of vessels so as to form dark or carbonaceous patches and masses; and, 4thly. Because dark grumous blood is found, not only in the right chambers of the heart, but in the left auricle and ventricle, in which they are not usually found in ordinary death. (*Practice of Physic.*)

Bulard is not less ingenious. He states plague to be the contagious product of lymphatic absorption. This view is grounded upon the statement, that the only symptom which has been remarked as alone and distinct from any other at the commencement of the disease, is pain in the lymphatic glands. This is at first but a slight throbbing, becoming more violent and continued, and ultimately succeeded by swelling and buboes. This change in the lymphatic glands is the only lesion which is to be found totally isolated from all others, and it is consequent upon changes in the lymph; and, therefore, each, during the local affections, is to be considered only as consecutive to this disorder in the lymphatic system; in which consists the simple original affection, the essence of the disease, and without which no general disturbance

could have occurred. This view Bulard supports on the grounds that the whole system of lymphatic vessels, whether going from or to the gland, is not diseased, but only the glands themselves; therefore, he argues, that, as these are always diseased and the vessels never, it is evident that the malady is not conveyed by continuity of tissue, but that the diseased principle is introduced into the lymphatic circulation; and, therefore, the alteration of the lymph is cause and reason sufficient for the phenomena of diseased absorption, the pathological effects of which are displayed on the glands. The disease, therefore, arises from a change in the lymph. This constitutes the primary affection, the secondary effect of which is, that as this degeneration in the lymphatic fluids becomes more or less advanced, the blood itself becomes decomposed by the morbid lymph entering into its composition by the venous circulation. It thus loses its normal qualities, and then causes a general disturbance, a deep disorganization in all its functions; in short, all the derangements of a true poisoning. From this moment it loses its physiological character, and assumes one entirely peculiar to itself: and hence are to be explained the lesions met with throughout the system—the livid colour of the stomach, the swollen state of its mucous membrane, the softened state of the spleen, gorged as it is with a black grumous blood, the enlarged and softened condition of the heart, &c.; in fact, every lesion which has been mentioned. Hecker, in his account of the black death, reverses the theory of Bulard, stating that the blood is first attacked through the atmospheric poison acting on the organs of respiration; and that the inflammation in the lymphatic glands and other organs is only consequent upon the change thus effected in the vital fluid.

IX. CAUSES.

Numerous conflicting opinions have been entertained as to the origin and spread of plague. We shall endeavour to condense this often discussed inquiry. The first point that naturally presents itself is to determine, if possible, the original source of the disease. It has already been stated, that plague is of very constant occurrence in some parts of Egypt and Greece, in Syria and Asia Minor; in which countries it not only exists in particular times epidemically, but isolated, or, as they are technically termed, sporadic cases are always to be met with. Wherefore we may infer that the causes which primarily produce plague are indigenous, and always more or less in active operation. What its source may be is, however, very difficult to determine; some imagine that it arises from miasms which are consequent upon the retiring of the Nile after its periodical overflowings, when it

leaves behind it a slimy deposit. Many arguments may, however, be urged against this. The numerous villages situated in the morass are neither the first nor the most constantly affected; on the contrary, observation proves that it first originates in towns situated on the sea-coast, and that in these places the mortality is ever the largest.

[Dr. Clot Bey says, that those who attribute plague to the overflow of the Nile, are ignorant of the nature of this overflow. The residue which is left by the Nile is nothing but pure earthy soil, without any admixture of vegetable or animal matter; the layer deposited is not much thicker than a sheet of paper, and it is even doubtful whether the irrigation be favourable to vegetation, so small is the quantity of alluvial matter lodged by the waters. Other writers speak of evaporation or exhalations from the Nile, which bring with them decayed vegetable matter from the marshes traversed during its course. Were this the case, plague should be most prevalent in Upper Egypt, where such marshes exist, and in Nubia; but it is almost unknown in these countries. The truth is, that very false ideas prevail concerning the overflow of the Nile. The inundation of Egypt is completely artificial, and takes place only when it is thought advisable to effect it by opening the dykes. Any extensive inundation is the result of accident; but even then it has not been observed that plague prevails more extensively, or with greater intensity, than at other times.]

Nor is it probable that it has its origin from the soil, not only because no peculiarities have been pointed out in this respect, but that it arises in soils of a totally different nature. We are, therefore, reduced to the belief, that plague is owing to certain occasional physical conditions, proper to the climate, and which may be termed its pestilential constitution. At the same time there can be no doubt that the habits of the people who inhabit this district, and the filth of their towns, engender a susceptibility of the influences which produce the disease. Some, and among these are Desgennettes, Savaresi, Assalini, Larrey, &c., even go so far as to believe that in these circumstances alone there is sufficient cause for its origin. Dr. Hancock, (*Cyc. Prac. Med.*,) who entertains likewise this view of the connection of pestilence with filth, attributes its non-occurrence in recent years in some cities, where formerly it occasionally committed its devastations, to a state of cleanliness and ventilation having superseded their previous state of filth and pent-up vapours. [Dr. Clot Bey observes, were this the fact, plague would be frequent in Upper Egypt, where it is unknown.]

From what has been said there is every reason to infer, that plague originally depends upon the action of some local influence, probably atmospheric, the nature of which, with all our increased

resources of extended knowledge, we are as totally incapable of understanding as our ancestors in the fourteenth century. We, however, observe that, in certain places, the disease so originated becomes diffused, and acquires what is termed an epidemic existence. It is highly important to inquire, whether this effect takes place solely through the immediate and still operating influence which originally engendered it, or whether the disease is contagious, or propagated by the miasm exhaled from the bodies of persons affected with plague.

Let us shortly examine the grounds upon which the doctrines of contagion are advocated.

First, as regards inoculation. Various cases are recorded of individuals in good health inoculating themselves with matter taken from buboes and carbuncles of plague patients. Very different results have followed this operation. In some instances the symptoms of plague have appeared, while in others the only effect was slight local irritation, as might be anticipated from inserting a poisonous fluid matter into the cellular membrane. But even had plague occurred in all these cases, no satisfactory conclusion could be deduced from the fact of their having been performed in situations where the disease was prevalent at the time. In order fairly to test the question, it would be necessary to institute a most unjustifiable series of experiments, namely, the inoculating with plague products persons living at a distance from the localities where this disease occurs, and who could have no communication either direct or intermediate with plague cases, except through the matter with which the experiment is made.

Secondly. The other modes by which plague, according to the contagionists, may be propagated, are by immediate contact with the person diseased; by exhalations from the persons of the sick; by fomites, or the imbibition of the pestilential vapour; by certain substances which are supposed to be capable of retaining it in such a state of activity as to have the power of regenerating the disease. This mode of propagation is esteemed to be more potent than either contact or miasmatic atmosphere. With regard to its propagation by immediate contact, Russell holds it to be an undeniable fact, that the plague is thus communicable, but that it is not ascertained at what particular stage of the disorder it is the most infectious. Some have laid it down as an established law, that the poison of the plague is so fixed that, in order to be infected, contact is absolutely necessary, and that the disease may be communicated no other way, unless by inhaling the pestiferous breath of the patient.

The chief facts on which it is presumed that the plague is communicated by exhalation from the bodies of the diseased, are the

modes in which it has commenced and spread in places where it has raged. Of these facts the following is a summary:—It is stated that the plague has been introduced into a district previously healthy, immediately after the arrival of an infected person; or that the first individual attacked has had intercourse with some person affected with the disease or recently recovered from it; or has been exposed to the influence of imported fomites, conveyed in various species of merchandize, especially bales of cotton, flax, &c.; and that where a perfect exclusion of all communication with the diseased districts can be effected by means of a strong cordon, complete security is obtained, although the disorder is raging violently without that circle.

The objections made to these views by those who maintain that the disease is solely caused by endemic influences are:—1. That a miasm emanating directly from a plague patient, or the transmission of the disease intermediately by fomites, are facts by no means conclusively proved; that, in truth, the whole statements in favour of contagion are imperfect and unsatisfactory. 2. That certain places, when the immediate neighbourhood was under the influence of plague, have not been kept healthy by means of quarantine regulations. It has often been shown, that in such situations some few cases have occurred, but that the disease has not spread; which immunity has been attributed to the ventilation and internal discipline rendering those within the cordon less susceptible of the epidemic influences. 3. That many of those who are in the most constant communication with the sick do not take the disease; that the attendants, who perform all the necessary offices, as well as the medical men, escape; and that many who have advocated the doctrines of anti-contagion, have ventured with impunity upon the more rash and hazardous experiments of tasting the secretions, wearing the clothes, and sleeping in the beds of those affected. That those engaged in burying the dead are not more subject to plague than other persons; and that sexual intercourse has even been known to have taken place without communicating the disease. 4. That the evidence of plague being communicated by inoculation is anything but satisfactory. It has already been remarked, that to make the experiment conclusive, the person to be inoculated with plague matter should be living in some district far from the local or general influences of the disease. On the contrary, those cases previously referred to, where this method produced no results, go far to negative the communicability of the disease through the medium of pus, or other plague products introduced into the system by inoculation. 5. That the occurrence of sporadic cases is conclusive against the notion that contagion is the sole origin of plague; and that the existence of those cases, without spreading the disease,

is a fact which militates greatly against its being contagious at all. It is evident that the occurrence of isolated cases in large cities, which is not unfrequent, is a fact totally irreconcilable with the doctrines of contagion as sanctioned by its advocates. 6. That when the disease becomes prevalent in a district, it is found to occur in situations and among individuals where there is the least possible communication with the infected, and that it frequently breaks out in remote and separate parts of a town, without any traceable intercourse or communication. 7. That in maritime towns, where it is said to have been imported, it frequently happens that those who are the first affected live in parts which are distant from the shore, and therefore not in the nearest and most likely places to receive the infection. 8. That it is found to arrive in many localities at the same time, and this applies both to the country and to towns. In the East it is frequently observed to arise within a few days in places which are not only very distant, but under circumstances which prevented communication; and to occur in like manner simultaneously in different parts of the same town—facts which evidently show a more diffused influence than is probable on the supposition of human contagion. 9. That notwithstanding all the very curious and ingenious modes in which the propagation of plague has been said to have taken place, the possibility of which it requires a very large share of oriental credulity to believe, the disease is really very difficult to propagate by any means which as yet have been devised by man. Many instances of adventurous experiment, made without success, sufficiently prove this. 10. That numerous instances may be quoted, of large masses of persons moving from an infected district without carrying the disease with them. The contagionists state, that immense multitudes of hadjis, or pilgrims, who go every year from Turkey to Arabia, through both Syria and Egypt, are the instruments by which the plague is spread in the countries thus visited by them. So far, however, is this from being the case, that the marches of these people in different years take place at different seasons, while plague is a disease more especially of one season; and that, excepting when these marches of the Mussulmen coincide with the plague season, their progress is not characterized by its occurrence; and, moreover, that many of the districts through which they pass during their pilgrimage are never known to suffer. That in 1824, when the plague raged so fiercely in European Turkey, many thousand Turkish pilgrims passed through Alexandria on their way to the Holy City; but in Alexandria there was only one case of plague, though no precautions were taken, and no quarantine regulations then existed to interrupt their progress. 11. That plague is a disease of endemic origin, and therefore that all those cases which are said to have been caused by contagion, are really owing to endemic in-

fluences. 12. That the spontaneous and sudden decline of plague at a particular season disproves the operation of a contagious principle, this being evidence that plague is influenced by climatorial changes—a condition which the advocates of contagion do not suppose consonant with its laws. That, on the other hand, it proves plague to be owing to some endemic influence which has now ceased to exist. That, on this periodic cessation taking place in the countries which are the most frequent seats of the disease, the inhabitants lose all dread, and, from experience, know that without any evil consequences they may meet each other, visit the sick, wear the clothes of those who have died. 13. That, besides the above more general arguments against contagion, an inference to the same effect may be drawn from the fact that, before plague sets in, especially in such countries where it is of more rare occurrence, diseases of a putrid character and fatal tendency are prevalent; and that epizootic affections take place, which frequently cause great mortality amongst animals.

We believe that we have briefly, though fairly, stated the views of those who advocate the plague to be a contagious disease, as likewise the chief objections offered to these views by the anti-contagionists. It has been seen that the statements of each party are sufficiently contrary; it may, therefore, be supposed to be somewhat difficult to arrive at any decided opinion upon the question. We are, however, inclined to believe that plague is essentially an endemic disease; that the causes, though unappreciable by us, become at times, from circumstances connected with season, which we likewise do not comprehend, so active and potent in their influences as to produce what is termed an epidemic; and that, when not occurring epidemically in those countries where such an effect often takes place, the causes are either dormant or only in a state of very partial or slight activity. That, during the continuance of the epidemic effect, a principle is given off from the body, which, if very concentrated, and pent up in confined and unwholesome situations, may generate the disease, so that, though not originally contagious, it may, in this way, by accumulation of animal miasms, be contagious; and that it is not improbable, when the disease is communicated from person to person, it is by the inhaling the pestiferous breath or exhalations which emanate from the body of the patient; but at the same time that this influence of the atmosphere of contagion is very limited in its power and extent. That a person who is himself uninfected cannot produce the disease in others by being, as it were, the bearer of it. That the communication of plague by inoculation with the matter from a bubo, or with any other morbid product, has by no means been proved; on the contrary, there is every reason to believe that the disease cannot be produced by

these means. That fomites in themselves have no power of transmitting the disease. That those who have long dwelt in a place where plague has existed for some time, become, as it were, fortified against its influences, and are therefore less disposed to be affected than those who come fresh into the pestilential atmosphere.

[The non-contagionists found their arguments against the propagation of plague by contagion, or infection, chiefly on the fact of its being a local disease, indigenous to the certain regions, where it prevails endemically and epidemically, being generated by certain meteorological or atmospheric conditions, entirely unknown, which they call the *pestilential constitution;* that it observes the same course as other epidemics, having a period of commencement, intensity, and decline; that it has a regular season; that Persia, though surrounded by the disease, very rarely suffers from it; that, although 70,000 or 80,000 pilgrims annually visit Mecca from plague districts, carrying merchandize from infected places, the disease rarely spreads; that the clothes of many thousands who annually die of plague are publicly sold after St. John's day, and that there is no evidence that those who purchase and wear them, catch the disorder; that inoculation has been practised with impunity; that it has appeared in localities where the strictest quarantine has existed; and that persons in constant intercourse with plague-patients escape the disease.

Admitting the correctness of these assertions, they are merely *negative* facts, to which *positive* facts, stated on undoubted authority, may be opposed. All that has been urged against the contagiousness of plague, applies with equal force in the case of diseases notoriously contagious—as small-pox, typhus fever, scarlatina, and measles. These diseases arise, or become epidemic from some atmospheric or terrestrial cause, rage for a certain time, and finally, when the epidemic cause ceases, decline. During their prevalence they spread both from an epidemic cause as well as by contagion. Diseases, in their commencement non-contagious, may acquire in their progress the property of infection, from high concentration of the original cause, or from generating an infected atmosphere. (*Ferguson.*)

A disease that can be communicated by inoculation must be contagious. Although the evidence of the communicability of plague by inoculation is, it must be admitted, contradictory, still there are several recorded facts by creditable authorities, which leave no doubt of the fact on our mind. As it is urged that the experiments are made during an epidemic, it is of course not demonstrable that the disease was not independent of inoculation. This argument is scarcely tenable in the following case, where it appears a carbuncle formed at the seat of puncture. Dr. Grassi, Protomedico

di Sanità at Alexandria, mentions the case of a physician who pricked himself on the ring finger of the left hand, in opening the dead body of a plague-patient. Four days subsequently, he was attacked with headache, pains in the small of the back, vomiting, and chills, which lasted until the following day, when he remarked on the finger a small phlyctena, and the corresponding axilla soon became swollen, and painful. The next day delirium occurred, and plague carbuncle and bubo were developed in the finger and axilla. He ultimately recovered.

When a disease appears in a previously healthy locality after the arrival there of persons or merchandize from infected districts, and when the first victims of the new disease are those who have had direct communication with the diseased comers, or the infected merchandize, there is good reason to believe that such disease is propagated by contagion. On the 29th of March, 1813, a ship arrived at Malta—which place had been previously free from any visitation of plague for 130 years—from Alexandria, where the plague was raging at the time of her departure, and two of the crew had died of it on the passage. The ship anchored, and lay in the harbour, close to the city of Valetta. The master died three days after her arrival. Remonstrances were made to the commander-in-chief for the removal of the vessel; but they were unheeded. On the 16th of April, the first case of plague occurred. The quarantine regulations had been lax. The first cases were in the house of a person named Borg, who with two others of his family were attacked. Some linen, which corresponded with that of a missing bale from the ship, was found in the house, and Borg died crying "Oh the linen, the linen." The next house attacked was that of a school mistress, a friend of Borg, who had attended him during his illness; and the progress of the disease was also clearly traced through her scholars. On June 8th, 1841, a merchant vessel arrived at Constantinople from Alexandria, with several cases of plague on board. Constantinople and the neighbourhood had been free from plague for three years previously. A lazaretto guardian, in perfect health, was sent on board, and assisted in landing the patients. He was taken ill on the 13th, and died on the 15th, with bubo and every symptom of plague. A porter, also, on the 22d, was found to have had symptoms of plague for two days, and a very large bubo in the left groin followed. He was conveyed to the pest-house and recovered. Two other persons connected with the lazaretto died. On the 26th of May, 1841, a vessel arrived in Malta, from Alexandria, with plague on board. The crew, and two boatmen who communicated with the vessel, were segregated. One of the boatmen was attacked with plague and died. A similar instance occurred in 1821, when an infected vessel arrived from Alexandria, and thirteen of its crew or passengers died of plague in the lazaretto. A Maltese who had had

the disease in 1813, believed himself protected, and volunteered to be the nurse. He was attacked with the symptoms of plague after eight days attendance. Other as undeniable instances could be adduced were it necessary. The first case is a striking proof of the importation of the disease into a healthy community, and of those who were first affected communicating the disease. In the second case, in a city of 800,000 inhabitants, free from epidemic influence, those brought in contact with the infected persons alone suffer. This case, Dr. JOHN DAVY says, "carried conviction to his mind, previously in doubt on the subject."

They bear, also, on another proof of contagion—that those in close connection with the sick, are the chief, or only sufferers. Dr. CLOT BEY acknowledges that, "many employées, but especially those who are most in connection with the patients," contract the disease, and die. Dr. ROBERT WILLIAMS (*Morbid Poisons*, p. 284), cites a number of striking facts confirmatory of this position. "The French army, on first taking possession of Egypt, lost no less than eighty medical officers by the plague, an immense proportion, compared with that of the army generally. * * * At length the French resorted to the expedient of employing Turkish barbers to dress carbuncles, buboes, and blisters, as well as to bleed the plague-patients; and after the adoption of this measure only twelve medical officers died in twice the former space of time. * * * In the English army, of 7883 Europeans and native Sepoys, only 165 died of plague, or about 1 in 48; yet, of 13 medical officers, seven died of this disease, or more than half." Similar facts will be noticed in treating of the effects of segregation.

Another proof of one of the modes of propagation of plague being by contagion, is the preservative influence of a separation of the infected from the healthy. We have already seen instances of this in the effects of strict quarantine in confining the disease within the lazarettos of Constantinople. In Malta, during the plague of 1813, when, out of a population of 90,000, 4486 deaths took place, between April and November, a whole city, closely *shut up*, enjoyed total exemption, though only 260 yards from Valetta, where the plague was raging. The same epidemic furnishes an example of plague being kept *within* a city, by the same means. In the village of Curni, only, plague lingered, when the remainder of the island was admitted to free intercourse; the authorities had it surrounded by a wall and a cordon of sentinels. The rest of the inhabitants pursued their usual avocations, and none of them contracted the disease. The convent of St. Augustine had been in strict quarantine, until a servant purchased some old clothes from an infected quarter; he was taken ill; a monk who volunteered to attend him, was placed with him in a separate apartment, caught the disease, and both died. At Moscow,

in 1770–71, the Foundling Hospital was "shut up," and the inmates, 1400 in number, were completely secluded. Some of the workmen got over the fences in the night-time, and were immediately attacked with the disease. They were promptly separated from the rest, and it did not spread. At Marseilles, in 1720, the bishop certified that "the plague had not penetrated into the religious communities, who had not held any communication with persons without." (*Williams*, p. 282.) The Naval Hospital at Malta was strictly insulated, and the only case that occurred, was in the person of the market man, who had strayed into an infected family. The inmates of the nunneries, prisons and convents, with the solitary instance just mentioned, enjoyed perfect immunity. Dr. Grassi states, that, during the plague in Alexandria in 1834, the squadron of 16,000 persons escaped, not from removal from the seat of infection, because other ships which had communication with the shore, lost many men, but from complete segregation. The arsenal, with 6,000 labourers, close to the infected quarter, was kept in strict quarantine; there was no decided case of plague. The Marine Hospital, although surrounded by three villages which were completely deserted from the effects of plague, remained healthy during the long time the plague lasted, a strict quarantine being maintained within its limits. At the Land Hospital, where the physician was a non-contagionist, and no precautionary measures were taken, the disease carried off many victims, and subjected the government to great sacrifices. During this plague, the college with its hospital, the populous harem of the viceroy, other establishments, and numerous private families were "shut up," and entirely escaped; while, of the Turks, who took no precautions, it is said that, on the decline of the disease, more than 100 keys were found at the police, of houses whose inhabitants had all perished. Dr. Gaetani Bey says "that in 32,525 persons isolated in quarantine, not one case of plague has been proved." Dr. Floquin gives another instance of the effects of segregation. "During the plague of 1837, 8 to 10,000 persons died in Smyrna, of a population of 40,000 Mussulmen, whilst scarcely 1000 died of a population of 55,000 Christians. Dr. Grassi shows that from 1831 to 1837, "the plague has ten times reached the port of Alexandria from without; that it has been eight times combated and subdued in the lazaretto; and in the two instances in which it penetrated into Egypt, the cause was the non-adoption of similar regulations."

We shall now briefly examine the mode of propagation by *fomites*, as on this belief are founded the laws of quarantine. The evidence on this point is contradictory. Bulard says "that this mode of transmission, in the actual state of science, can neither be sustained, nor combated logically." Sir James M'Grigor, in evidence before a parliamentary committee, stated, that he could

speak with certainty of both the clothing of the men, and of blankets having conveyed it. An Armenian banker quitted precipitately his country-seat on the Bosphorus, in consequence of a case of plague occurring amongst his domestics. Everything was tolerably well purified in the usual manner, with the exception of a couple of trunks, containing fur, shawls, &c. The following spring, the proprietor wishing again to occupy his summer residence, ordered his servants to open the trunks with precaution, and air the contents. Two of the number were attacked and died of plague, though at the same time the public health was good. (*Report to House of Commons, &c.*) The officers of the French army, when in Italy, became so convinced that clothing communicated the disease, that Napoleon ordered all such captured articles to be burnt. A man in the village of Curmi (before alluded to), stole, and buried in a box, some articles of wearing apparel. Upwards of two months after the plague had ceased in Casal Curmi, this man dug up the box, and carried it to the island of Gozo, which island had adopted the strictest quarantine, and had remained till this time free from the plague. At a marriage in his family, he opened this box, to present a silk covering for the head to the bride. He, the female, and the priest, all became affected with plague from that day and died. From that family the disease spread to others, till it pervaded the island. This fact was recorded in a government dispatch of Sir Thomas Maitland. There is, then, we think, good reason to believe that the clothes of plague-patients not exposed to the air and light, may and do communicate the disease. There is no sufficient proof that there is danger of contagion from merchandize, or the clothes and bedding of plague-patients which have been exposed to the air.

Plague we regard to be like small-pox, both contagious and infectious. *Actual contact* alone is not dangerous, but *close approach* is probably necessary, the infecting distance being but small, a certain dilution of the atmospheric air rendering the emanations harmless.

For much valuable information on this subject, consult two excellent articles in the *British and Foreign Medical Review*, for October, 1843, and January, 1845; also a contribution of the late Dr. Ferguson, the Inspector General of Army Hospitals, on the Importation and Propagation of Plague, in the *Edinburgh Medical and Surgical Journal*, January, 1843.]

The *predisposing* causes of plague are soon summed up. Independently of the greater susceptibility of the prime of life and robust health, they are chiefly such as are the ordinary predisponents of fever, as terror, anxiety, dissipation, and exhausting exertions, want of rest, indulgence in the passions, whether of anger or of fear, &c.; but, more particularly, dwelling amidst filth in confined

and ill-ventilated rooms or situations which are subject to noxious vapours.

X. PROPHYLACTIC MEASURES.

Various means have been suggested in order to prevent the occurrence of plague. The chief of these are, cleanliness, free ventilation, sobriety in all things, a sufficiency of good and wholesome food, the avoiding crowded rooms, and the frequent ablution of the body with cold water. This last deserves much attention, as it has been observed, that the water-carriers of Cairo enjoy a most singular immunity from the disease. It is also not improbable that the lighting fires in houses, and thus effecting a perfect ventilation, would be attended by the most beneficial results, together with a judicious use of the chlorine gas, vinegar, and aromatics. There can also be no doubt, that it is the duty of all those whose sphere of life does not permit their rendering essential service to the afflicted, to remove if it be in their power, from the seat of the disease, as by this means the number of victims is lessened, the district is less crowded, and more food and accommodation are left for those remaining.

Galen and many others have noticed, that those who had issues fully discharging, did not fall victims to the disease; and Larrey, when with the French army in Egypt, mentions the curious fact before alluded to, that the plague rarely attacks wounded men whose wounds are in a state of plentiful suppuration; but that as soon as the wounds are skinned over, the immunity is no longer enjoyed. On these grounds it has been suggested, that issues might be employed as a preventive against the disease; and certainly there is every reason to anticipate success from it. It has likewise been observed, that those persons whose trades oblige them to be covered with oil, or any other greasy matters, are less susceptible. This has induced many to adopt frictions of this kind, and with a seemingly beneficial result; it may be therefore recommended to be used for such a purpose, especially as no injurious consequences have ever been noticed to follow its adoption. Inoculation, though sanguine expectations have been entertained upon it, has totally failed as a preventive against plague. In fact, the disease has never yet been satisfactorily shown to be produced by this means.

It may evidently be understood from the summary of opinions which have been given on the origin and progress of the disease, that we cannot be advocates for the system of quarantine. The laws and provisions made in order to enforce it, must not, however, be passed over in silence.

We believe that were they perfect and practically well carried out, which they certainly are not, they would yet be, comparatively speaking, useless. But they are, as now worked, not only useless, but most severe and vexatious incumbrances upon the liberty of the person; while the lazarettos, from the situations in which they are placed, from the nature of the buildings themselves, from the ignorance of the medical men who are appointed to them, tend unnecessarily to harass and annoy the individuals condemned to confinement in them, as also to constitute them places where disease may be rather originated than prevented. To speak of the mal-administration of the quarantine laws belongs, however, rather to the jurist than to the physician; we therefore content ourselves by referring here to the full and complete exposures of the cruelties, hardships, absurdities, and even iniquities of the whole system, in the short but pregnant pamphlets on Quarantine by Bowring and Holroyd.

[From what was said in support of the contagious nature of plague, and in proof of its importation, it will be readily inferred that we regard the sanatary regulations in countries where plague prevails as a salutary institution, and that their abolition would be injurious. The effect of interior quarantines and sanatary police, during the last six years, has been to banish plague from Turkey. A recent Report on the Contagion of Plague, and Quarantine Regulations, presented to the British House of Commons, contains many interesting facts on this question. The Consul Sandison writes in 1842, "I can recollect no former period during which there has been such a cessation or diminution of the plague throughout the whole extent of the Turkish territory, as since the establishment of quarantines, imperfectly as they have been hitherto regulated." In 1812, 3,000 died daily in Constantinople, and 1500 daily in 1834, and 1836; and in Smyrna between 30,000 and 40,000 (one-third of the population) were swept off.]

XI. TREATMENT.

The treatment of plague arranges itself under the heads of general and local:—The general treatment to be followed is, in great measure, that which is ordinarily resorted to in typhus fever. On the first attack the primæ viæ should be cleared. Most practitioners recommend the immediate exhibition of a smart purgative combined with mercury. With regard to the exhibition of calomel, Bulard says, that "his experience leads him to believe that it is always thrown up by vomiting, or evacuated by the watery motions which it causes." He also states, that "supported by the observations of M. Velpeau, on the ap-

plication of mercury in acute peritonitis, and by the known action of this remedy on the lymphatic glands, he tried mercurial frictions and blue pill; the effects were such, that it remained doubtful whether the patients so treated suffered from the disease produced by the medicine, or from some new phase of the disease itself, which might have occurred without the exhibition of mercury." With regard to the use of mercurials, BULARD asserts his conviction, that it is a remedy in which much faith is not to be placed. Sir JAMES M'GREGOR states, however, he not only used it as a purgative, but urged its exhibition until some soreness of the mouth was produced; the consequence of which he reports to have been, that the skin became softer, the pulse more regular, the eye more clear, the tongue more moist, and that the thirst with the affection of the head and of the abdomen entirely disappeared. The evacuations were also copious, and approached more nearly to their natural colour.

The exhibition of the cathartic at the onset of the disease should be followed up by saline diaphoretics, and the free use of cooling diluents in order to promote a free perspiration. The best medicines of this class are the spirits of mindereris, the nitric æther, and camphor mixture. This line of treatment is much aided by cold ablution. FAULKNER reports its use to have been followed by very immediate and good effects,—the patient being soon relieved in all his feelings; and, when aided by sudorifics and diluents, that the perspiration, which comes on, is succeeded by a remission from all the symptoms. He details a case reported to him by a Maltese practitioner, which is very illustrative of the good effects derivable from the sudden application of cold water. A man in the height of delirium, and labouring under a most unpromising form of the disease, ran violently out of his chamber and precipitated himself into the sea. From this he seemed to experience sudden relief. He repeated this a second time, which evidently restored him to a state of convalescence, from which he perfectly regained his usual good health. Sponging with vinegar has likewise been much recommended, and there can be no doubt, from its being a grateful operation to the patient, that it is a salutary adjunct to the general treatment. Blood-letting has had its advocates in plague; but the general feeling, unless it is very early carried into effect, is decidedly opposed to its employment. A small quantity of blood taken from the arm at the very onset of the disease may occasionally be useful; but its general employment can by no means be advised, when we find Dr. WHYTE stating, that he used the lancet freely, but that in every case in which he did so death followed.

Opium, if used with great circumspection, has been found a valuable remedy, by producing composure and a gentle perspiration; but it is a medicine which must not be administered if there

be any great tendency to cerebral excitement. In the advanced stages, given in conjunction with the cautious exhibition of wine and other stimulants, it is decidedly beneficial.

Emetics have been much recommended by some practitioners, who state that they not only unload the stomach and small intestines, but in great measure aid in relaxing the skin, and in bringing on a favourable state of perspiration.

The Maltese physicians, as well as the Egyptian, are favourably disposed to the free use of vegetable acids, and particularly lemon juice. The nitric acid taken much diluted as a common drink, has been found very beneficial. It has also been used in the form of a bath, but without success. (*Macgregor's Medical Sketches.*)

Frictions with warm oil have been in some cases found very serviceable, so much so, that Luigi of Pavia, who for twenty-seven years superintended the pest-house at Smyrna, states them to be more efficacious both as a prophylactic and as a means of cure than any other course. Subsequent experience does not, however, fully bear out the sanguine expectations of Luigi. The result of their employment in the French army in 1798 and 1799 has induced the physicians who accompanied it to declare them to be totally inefficacious, and even to speak of them as injurious from the fatigue they entail on the patient.

The local treatment for the most part is very simple, amounting to the application of bread and water poultices to the buboes, and mild ointments to the carbuncles: occasionally, if there be deficient action, some of the digestive or resinous applications may be substituted. A great point to be attended to is, to obviate the tardy rise of the glandular swellings. Many of the French surgeons speak very favourably of the use of the actual cautery and the potassa fusa. Bulard speaks highly of the artificial formation of buboes by irritating the neighbouring lymphatics. He says, experience taught him that there is every probability of a recovery, when, at the commencement of the disease, carbuncles with broad bases made their appearance, and when the buboes in the groins and axillæ were developed quickly, and ran on speedily to suppuration. In consequence of this, he inoculated those patients in whom these symptoms were wanting, causing thus artificial buboes and carbuncles; and the majority of persons so treated recovered.

Clot Bey, in a letter to Dr. Chervin, (*Brit. and For. Med. Rev.*,) thus sums up the line of treatment to be pursued:—"The first symptoms are pains in the head, nausea and vomiting, injected eyes, staggering walk, as if from drunkenness, &c. At this period, emetics and diffusible stimuli may be tried. On the second or third day there is mental confusion, sometimes delirium; the tongue is dry in the centre, with red edges; the skin hot; there is

often pain in the epigastrium, rarely diarrhœa, buboes, and carbuncles. There is now actually irritation in the digestive canal, brain, and lymphatic glands, and bleeding and cupping are employed, with cauterization of the buboes and carbuncles to fix the irritation in the skin. On the fifth and sixth day petechiæ and blue patches on the skin; revulsions to the extremities." This treatment has apparently saved some patients.

Such is a sketch of the modes of treatment which have been resorted to in plague; but meagre and unsatisfactory as it is, our feeling in regard to them must yet be still further depressed, when we find a recent writer stating that, after five months' experimenting with all kinds of treatment, and all modifications of it, in about 1000 cases, he at last arrived at the melancholy conclusion, that though the medicines produced their effect upon the organization, yet the malady neither ceased nor changed.

CHAPTER V.

YELLOW FEVER.

[Syn.—*Febris flava, F. Americana, Typhus tropicus, Typhus icterodes,* Cullen; *Pestis occidentalis, Vomitus niger; Typhus of the West, Bulam Fever, Barcelona Fever, Kendal Fever; Fièvre jaune, F. icterique, F. matelotte, F. de Siam,* Fr.; *Vomito negro, Vomito prieto,* Sp.]

Yellow Fever is a disease which is not of unfrequent occurrence in the West Indies, in Africa, on the eastern coast of Spanish America, on the southern shores of Spain, and western shores of America. It has been described by writers under the several names of *Typhus icterodes, Bulam fever, Bilious remitting fever, Vomito negro, Vomito prieto, Endemial causus, Mal de Siam,* &c. &c. To those commencing the investigation of yellow fever, it must be matter of much surprise to observe the contrariety of opinion which has been entertained, both as regards its nature and origin. Much of this has arisen from its symptoms being very varying and irregular in different cases, and under different circumstances; indeed, the changeableness of its phenomena renders it a matter of great difficulty to arrive at anything like a succinct and appropriate nosological definition. Dr. Gillkrest, who is the last and one of the most intelligent of the writers on this disease, says, that it is a fever in which "yellowness of the skin, partial or general, and towards the fatal termination vomiting of a black or dark brown fluid are frequent, *though by no means, constant* occurrences." (*Cyc. Pract. Med.*, art. Yellow Fever.) This evidently amounts to no definition at all, and others which might be quoted are equally inapposite. Feeling the difficulty of supplying this deficiency by one that is unexceptionable, we prefer recognizing the disease only from its general description. In doing this, it is proposed, first, to take a view of the simple or more usual form in which it occurs, and then of the more prominent varieties which may be referred to one of three divisions, which we propose to designate, 1. *The inflammatory;* 2. *The adynamic;* and 3. *The congestive, or malignant.* These, we feel assured, after much consideration, and a careful review of the works of those who have enjoyed ample opportunity of accurately observing yellow fever as modified by climate and situation, will enable us to give a full and comprehensive history of its phenomena.

I. SYMPTOMS.

The attack is for the most part, though not always, preceded by well-marked premonitory symptoms. These vary according to the peculiarities of constitution: generally speaking, however, for two, three, or four days, the mental energy and natural activity of disposition are depressed, and the spirits are low, without any accountably apparent reason. There are also occasionally faintness and debility, with slight creeping chills and nausea, pain in the loins, back, and extremities, some slight pain and giddiness in the head. The eyes, with a suffused ferrety appearance, look dull and watery, a heavy pain is experienced in the eyeballs and brow, and the vision is dim and sometimes double. There is often also slight confusion of thought, and the patient, though desirous of rest, is unable to take it, being oppressed by a drowsy restlessness. The taste is perverted, the appetite bad, accompanied occasionally with sensation of heat of stomach, and dull pain in the right side; very frequently there is a flatulent and inactive state of the bowels; but this can in no way be depended upon as an initiatory symptom, as it not unusually occurs, that the opposite condition, slight diarrhœa, obtains. The same may be said in respect to the state of the skin; for, as Dr. Rush observes, the premonitory period is sometimes marked by a disposition to sweat at night, or after very moderate exercise; while at other times there is a sudden and complete suppression of the cutaneous secretion. Boyle, (*On the Diseases of Africa*, p. 128,) who confirms this, nevertheless states that the temperature of the skin is always above the natural standard. The pulse varies in many respects; in some cases it is small, hard, and, as it were, contracted; in others soft, fluttering, or undulating, and as often regular as irregular; occasionally it is full, open, and bounding. This series of phenomena, as before said, does not always take place. Occasionally it happens that persons apparently well on going to bed at night have awakened with a chilliness, which is immediately succeeded by the disease itself; others, again, are seized at work during the day, after having passed the previous night in a natural and refreshing sleep.

Occasionally, though very rarely, the premonitory symptoms are accompanied by a yellowness of the skin and eyes. Such a state usually augurs severity in the after disease. In these cases, even before the fever can be properly said to have manifested itself, there is a vomiting of green bile; and the early alvine evacuations, at least those which are procured from the lower bowel, scarcely ever fail to exhibit a very dark tar-like appearance, and to emit a most offensive odour. Sometimes the initiatory period

is characterized by absence of all pain, but the patient expresses himself as being merely inconvenienced by an indescribable sensation of general *malaise*. According to Dr. Rush, some of these symptoms frequently continue for two or three days before the patients are attacked by the fever; while with some persons they continue throughout the time the yellow fever remains epidemic, without being followed by the disease.

The commencement of the fever, which, according to Sir W. Pym and Dr. Smith, most frequently takes place during the night (according to the latter in four-fifths of the cases), is occasionally, though not often, attended by a slight shivering fit. The most usual course is, that the initial symptoms are succeeded by a state of general excitement, which sometimes increases to a most unmanageable and distressing extent, and by the accession of severe pain in the eyeballs and head, in the back and loins, and severe cramps in the calves of the legs. The position which the patient assumes is almost always the recumbent, when he invariably lies upon the back, and exhibits a constant disposition to throw the arms above the head. The countenance is expressive of deep-seated pain; it is usually flushed, sometimes to a crimson hue, and occasionally swollen to so great an extent as to appear bloated and heavy. The eye presents appearances which furnish some of the chief characteristics of the disease. This organ is swollen, deeply injected, and moistened by tears, and has a dull or rather heavy drunken appearance—which peculiar expression is apparently owing to the cornea either retaining its natural, or else assuming a more than usually brilliant appearance, while the interstices between the fully injected vessels of the conjunctiva remain of a white colour. Sometimes these vessels are so thickly injected, as to give that portion of the membrane through which they traverse a beautiful pink colour. There is generally also considerable and permanent dilatation of the pupil, and the balls are often protruded, and seem ready to start from their sockets. Chisholm makes the remark, that it often happens that the right eye is the most considerably affected; and that, when this is the case, the pain is felt chiefly in the right side of the head. The skin is flushed, dry, and warmer than natural, but it has not that peculiar feeling of pungency often observed in typhus fever. Warren, in his description of the malignant fever of Barbadoes, speaks of the skin being more often imbued with moisture, and that generally there is a disposition to free perspiration: however true this may be in the after periods of the disease, it is decidedly not the case in the first stage. The pulse is accelerated, and generally full, soft, and compressible; sometimes it is unusually slow; and cases are recorded where it has not exceeded forty-five, and, according to Chisholm and Physick thirty. Under these circum-

stances the temperature of the surface is usually unnaturally cool. The tongue is swollen, flattened, pointed, and coated with a white moist slime. Though occasionally the pain of the præcordia is severe during the first stage, it is yet not generally so; in fact, the stomach appears free from irritation; and vomiting, which so often accompanies the initial symptoms, now appears to be quite suspended. According to Moseley this shows that the derangements in the functions of this organ are rather owing to irritation than to superabundance of bile, as some have supposed. When, however, pain and extreme distress are experienced at this period, there is usually much epigastric tenderness, and spasms of a most violent kind take place, both in the muscles of the abdomen and legs; vomiting may now ensue, but what is thus voided consists entirely of the ingesta. The bowels appear in many instances to be little if at all deranged; generally, however, there is a tendency to costiveness; but even under such circumstances, the motions which are procured by the aid of medicine, instead of being bilious, soft, or liquid, are formed healthy in character, and without any unpleasant fetor. The respiration is usually nervous, hurried, and attended by constant deep sighing; the anxiety of breathing appears to keep pace with the heat of the surface. As the temperature of the skin rises, so does the respiration become more hurried. The intellectual functions are more or less disordered; now and then coma comes on, which is usually preceded by a sudden and short attack of delirium.

This first stage continues from twelve to thirteen hours; its decline is marked by slight tendency to moisture on the skin, with a prostration of the mental and bodily powers; a state which Moseley has termed a collapse or metaptosis. This state has often been mistaken for a remission, instead of which the symptoms are becoming more severe. The excitement which has been maintained during the previous stage is superseded by a state of depression, characterized by collapse of the features, paleness of the surface generally, and a total absence of pain; while at the same time there are evident signs of supervening irritability of the stomach, and a general tendency in the vessels to throw out blood.

Before long, the second stage fairly sets in, and with a more formidable array of symptoms than might have been expected from those which were the attendants of the first stage; the position of the patient is uneasy and constrained; the hands and arms are constantly twitching, and the legs frequently drawn up towards the abdomen. The countenance, though not so florid as in the previous stage, yet retains a considerable portion of colour, which partakes rather of a damask hue, from being blended with the yellow tinge of the surface, a colour which the skin now begins to assume. In the eye similar changes are perceptible; the

inflamed and injected state of the vessels begins to subside; the eye thus becomes less turgid, while the conjunctiva, especially towards the inner canthus, begins to take on a deep yellow colour, which very early extends itself down the alæ of the nose, and round the mouth. The whole expression of the countenance becomes altered, and in place of the excited aspect which the features have hitherto assumed, they are now expressive of a deep-seated anxiety, giving the character of a sad, depressed, and pensive state of mind. The moisture, which showed a disposition to pervade the surface of the skin, does not fairly come out, but is unequally distributed in patches over the body, some portions maintaining their dryness and slight elevation of temperature.

Though in many of the milder cases the yellow colour does not extend generally over the surface, but is confined to the conjunctiva, yet most commonly, as this stage advances, the skin becomes of a yellow tinge, varying in hue according to circumstances. If the complexion of the patient be fair, it is generally of a light, or what may be termed pale lemon, or even of a bright golden yellow, passing, as the disease advances, into a greenish-mottled and bruised appearance. In those who are naturally sallow, it assumes a deep orange or saffron colour; in some it resembles a vegetable stain of a dingy yellow tint, in others it is not unlike that cadaverous hue which is seen on the surface of bodies in the first stage of putrefaction. These changed colours of the skin are sometimes maintained until, and even after death. Though this condition, if fully developed, is an almost certain prognostic of a fatal termination, it is by no means constantly so; nor are the accompanying symptoms always severe in themselves. Townsend observes that, in some few mild cases, the only symptom was this peculiar greenish yellow tinge, which gradually came out and spread entirely over the trunk and extremities, while the pulse, skin, and other functions, remained perfectly natural. (*Account of the Yellow Fever*, p. 151.) Dr. Harrison relates a similar case, in which the patient continued to walk about for several days, as though he was in perfect health. In this case the stomach and other organs regularly performed their duty, but black vomit suddenly came on, and death took place in a few hours.

The pulse, though slightly lessened in frequency, is still full, but softer and less resisting: occasionally it falls below the natural standard, but as yet it is never found to intermit. The tongue, though sometimes retaining its moist and dirty white coat, usually acquires a dry yellow crust, especially towards its root, the edges and tip having a clean and dry red appearance; and in cases which have a fatal tendency, it is frequently tremulous on being protruded. The lips are dry, parched, and sometimes cracked;

they look glossy, and more florid than is natural, while their superficial vessels show a tendency to ooze out blood and sanies. The stomach becomes irritable and painful, especially on pressure; the passive state which prevailed during the previous stage, is now very sensibly superseded by the most active functional disorder. Food or medicine is immediately rejected. The sensation of internal heat in this viscus is particularly distressing; at the same time there is a remarkable absence of nausea. The vomiting which takes place is sudden, and not accompanied by any continued or severe retching. Generally speaking, the matters vomited consist only of the ingesta; sometimes, however, bile is likewise discharged, which, according to Dr. Stevens, is exceedingly acrid, and frequently it inflames the biliary ducts to such a degree, that when the secretion ceases the surfaces adhere, and after death they are impervious even to the smallest probe. (*On the Healthy and Diseased Properties of the Blood*, p. 218.) The acrid bile must be a source of irritation to the intestinal canal, and is probably the cause of the severe cramps: in some cases such is its acrimony, that when applied to the skin, it excited inflammation, and has been known even to corrode the pewter vessel in which it was received almost as rapidly as a strong acid. Flatulence is very frequent and urgent. The alvine secretions for the most part maintain a natural appearance, though in some cases they are dark-coloured and evidently bilious. The secretion of urine is much diminished; in fact, there is an evident tendency to suppression, which occasionally continues for days; and, should the skin be yellow, the urine partakes of the same character. The respiration, though sometimes remaining difficult as in the previous stage, is, generally speaking, unembarrassed. Deveze, however, says that the respiration is always difficult in this stage. Townsend very properly remarks, that one would suppose, by the indistinct manner of writers, that the respiratory functions were as much disturbed in this disease as in pleurisy. The only appearance of diseased action attending this function is, that the sighs are frequent, deep, and prolonged. Stevens says, that the breath which is exhaled has a peculiar acid odour, and that the degree to which this exists is, perhaps, the best criterion of the malignancy of the case. The intellectual functions are evidently deeply affected. The patient is either in a state of low muttering delirium, or in a comatose condition; from which, however, he may be roused, when he answers questions put to him pertinently, but soon lapses into his former condition. Sometimes there is a state of the most irritable and active delirium, during which he is particularly loquacious; in fact, his condition is not unlike, in this respect, that of a patient suffering under the active stage of delirium tremens. Convulsions sometimes, though rarely, take place during this stage of the disease. The organs of generation are

very liable to inflammation, accompanied with an adhesive sanious discharge. This stage is besides often accompanied by petechiæ of different sizes, occurring especially about the cheeks, neck, forehead, backs of hands, arms, chest, &c.; sometimes intermixed with small vesicles. A miliary eruption sometimes makes its appearance without the admixture of petechiæ. Besides these, there have been observed prickly heats (*Moseley*), boils and small abscesses (*Warren*), or white pustules (*Blane*). Carbuncle is very rarely met with: of 7000 deaths at Cadiz, in 1800, there were only three instances of it.

This stage may continue from two to six or seven days, and passes almost imperceptibly into that of the third, which is characterized particularly by an aggravation of the previous symptoms. The countenance becomes more collapsed and anxious; the conjunctiva loses entirely its injected appearance, and passes from a yellow into a greenish colour, which, as Townsend remarks, when contrasted with the brilliant colour of a blue or hazel cornea, gives an unnatural and even grotesque appearance; the eye loses its full and prominent character; the eyelids become swollen and discoloured, especially the under lid, which has the appearance of blood being extravasated through its tissue; the surface of the skin generally is darker, and the discoloration extends over the whole body, with the exception of the feet, which are rarely yellowed until a short time before death. Not unfrequently there appear dark-coloured blotches and vibices on different parts of the body. There can be no doubt that these appearances are owing to a broken-down state of the blood, as is evidenced by this fluid exuding in a watery and bright-coloured state from the mucous lining of the nose and mouth, or, in some cases, from blistered surfaces. The consequence of this exudation is, that much of it dries upon the external edges of the nostrils, lips, teeth, &c. The pulse becomes small and thready, though at times full and accelerated, yet compressible; the tongue now loses its white, moist, or brown character, and presents a dry, inflamed, raw surface—sometimes with a dry brown fur covering its centre; at times this organ has appeared to have been partially paralyzed, so that the speech is indistinct, and the voice thick, but not diminished in strength; the mucous membranes of the eyelids and of the interior of the mouth become spongy and of a deep florid colour, while the lips are pale or livid; the voice becomes hoarse; the patient complains of the throat itself being dry; at the same time thirst, which is a rare symptom in the earlier parts of the disease, becomes urgent, leading to the inference that this symptom is owing to the local state of the part, and not to the general condition. It is worthy of remark, that yellow fever is not attended by those disagreeable cadaverous smells so often observed in other fevers. As the dis-

ease advances, the pain in the region of the stomach increases, and the least pressure adds to the patient's agony. An eructation of wind, or swallowing fluids hot or cold, causes an involuntary drawing up of the legs.

This state is followed by vomiting of a grumous-looking fluid, which has been technically called the *black vomit*—in fact, it has in some countries given the name to the disorder: thus, in Spain, from the occurrence of this peculiar symptom, it is called the *vomito prieto*, or *negro*. This vomiting does not, however, always occur, even though the nausea, and other evidences of stomach affection, may be present. The alvine discharges often retain, even to the last, a healthy appearance, and are totally devoid of nauseating smell: sometimes, towards the end of this stage, while the dejections are evidently composed of the same grumous exudation as the black vomit, they often assume the natural appearance, even when the other symptoms indicate an aggravation of the disease. As this stage advances, the anxiety and restlessness increase to a most distressing extent, which, with loss of sleep, portend danger. The intellect is not so much affected as might have been expected; though there may be excitement and slight confusion, there cannot be said to be delirium. The respiration is hurried, noisy, and evidently laborious, the muscles of the neck and chest being violently brought into action to support the effort required. The whole appearance of the patient is that of exhaustion. The surface and extremities become very cold, and covered with a general clammy perspiration, excepting over the hypochondriac regions, where the temperature is still maintained. Tremor and subsultus sometimes, though not very commonly, ensue, and occasionally there is strabismus. Townsend says, however, that more frequently, at this late period of the disease, the eye and countenance remaining calm and perfectly natural in their expression, and the intellectual functions unclouded, the patient lies tranquil and unconscious of danger, and expires without a struggle. Dr. Rush says, the last hours of life in some were marked with great pain and strong convulsions, but in many more death seemed to insinuate itself into the system with all the gentleness of natural sleep. To the experienced eye, however, the general expression, the unsteady small pulse, the clammy perspiration of the forehead, &c., too truly betray the alarming condition of the patient. In some very aggravated cases a curious state has sometimes occurred, notwithstanding the depression of the powers—the patient rises from his bed, and in a staggering manner walks about, and really effects feats of very considerable exertion, sometimes even with the appearance of so little weakness that, to bystanders, it scarcely appears the patient is labouring under disease. This form of yellow fever has been called the *cold walking fever*.

Such may be esteemed to be the more ordinary symptoms of yellow fever. There are, however, many deviations from these, and which, from occurring in different years and at different places, have given origin to the contradictory statements and opinions as to the very nature of the disease itself. The variations are, however, to be regarded as merely those departures from its more usual course to which it, in common with other forms of fever, is liable. These we shall endeavour to point out under one of the three following divisions:—The *inflammatory*, the *adynamic*, and the *malignant*.

1. The *inflammatory* form commences with initial symptoms characterized by more weakness, and faintness, and nausea, which, after a period of ten or twelve hours, are followed by sudden development of excessive arterial reaction, more especially observed in the carotid and temporal arteries; the pulse is quick, generally full, tense, and strong; there are much anxiety and constriction of the præcordia, with hurried breathing, and desire for cool air; while the nausea increases, and terminates in retching or vomiting; the face is frequently flushed; the conjunctiva deeply injected, and gives the countenance a heavy dull expression; the tongue is coated with a yellowish-white fur; the thirst is urgent; the skin dry and parched, though occasionally moist; severe shooting pains are felt in the head, loins, and extremities; the bowels are confined; and the urine scanty and high coloured.

This stage lasts from twenty-four to sixty hours, and is gradually converted into the second, in which many of the symptoms are gradually subdued. The heat of skin completely passes off, and is succeeded by chilliness, and the pulse becomes more slow and soft. Though these appearances may appear favourable, there arise too many other indications of a contrary tendency. The eyes look glassy; there is confusion, and occasionally low muttering delirium; the pain and sickness of stomach become more urgent, and the vomiting more frequent; the skin is imbued with a clammy moisture; the tongue is dry, covered with a brown fur, beneath which its surface is rough and cracked; the urine is in great measure suppressed, and the little that may be secreted is of a brownish-yellow colour.

After this state of things has continued with varying intensity from twelve to thirty hours, a change ensues, which is the commencement of the third stage: the pulse becomes rapid and intermitting, the pain accompanying the vomiting is distressing in the extreme, and the matters vomited are of a dark colour, not unlike coffee grounds; the tongue is black; the lips and mouth coated with a black sordes; cold clammy sweats pervade the surface: and the whole skin becomes yellow, first commencing in

discoloration about the mouth, nose, and temples. This state, when fully confirmed, is the commencement of a fatal termination; an event which is preceded by delirium, laborious respiration, convulsive sighing, subsultus tendinum, faltering voice, bloody exudations from the mucous surfaces of the nose and mouth, petechiæ, frequent vomiting of black fluid, burning heat of the stomach, hiccough, and eventually coma.

This form of the disease varies greatly in intensity and in its period of fatality; occasionally the symptoms are so slight, that, though presenting all the characters of the inflammatory variety, convalescence is established without their having assumed any peculiar urgency; at other times they set in with such determined violence that the patient sinks under their influence in the course of twenty-four hours: generally, however, in fatal cases, the period is from three to five days. Its victims are usually of a full plethoric habit, such as might be called of a strong healthy constitution.

2. The *adynamic* variety, on the contrary, usually occurs in those whose frame is expressive of deficient animal vigour, and in whom the circulating system is for the most part depressed. The initial symptoms, which are often prolonged for days, are usually a varying degree of nausea and faintness, slight headache and confusion, with occasionally dimness of vision. On the attack setting in, there is sensation of great oppression, with severe headache and excruciating pain in the loins, legs, and feet, and, as in the former variety, tenderness in the region of the stomach, accompanied by nausea and vomiting, urgent thirst, and costive bowels. Unlike the inflammatory, however, the skin is usually soft and bedewed with a clammy softness; and, as Dr. Craigie describes it, "a fixed sensation of cold, pervading the person deeply, and rarely interrupted with flushing and other marks of heat, is slowly succeeded by a sensation of heat, which, though pungent at the epigastric region, under the arms, and inside the thighs, is seldom strong or high on the exterior of the person or the mucous surfaces." The tongue is white and moist, the pulse small and weak, the eye of a dingy colour, and languid in its movements, the whole expression of the countenance partaking of the same character. This state, which continues often for some hours, according to the severity of the attack, is succeeded by one in which the above symptoms become aggravated, excruciating pain of the stomach, vomiting, general torpor, and low muttering delirium supervening. This state is followed by coma, during which the skin, now damp and flaccid, assumes an olive colour, and becomes spotted with livid vibices; the conjunctiva of a dirty yellow colour, and the countenance expressive of the fatal termination, which is usually accelerated by copious hemorrhage from the nose, mouth, and intestines—the black matter

which is now vomited, as well as the fecal discharges, being mingled with the blood. This form of disease usually proves fatal within four or five days.

3. The *malignant* or *congestive* form of yellow fever is particularly characterized by early oppression, and the almost total absence of any symptoms of reaction. From the commencement the patient makes but little complaint, and with the exception of pain in the region of the stomach, expresses no particular uneasiness. He lies quiet, and though there is very considerable muscular power remaining, makes no effort to move. He is for the most part taciturn, and might almost be supposed to be asleep, were it not for the eyes which are wide open: sometimes this state is slightly interfered with by transient delirium. The eye itself is of a dull red, and has a drunken, dull, agitated stare. The countenance from the very first is indicative of the malignancy of the disease; it is ash-coloured and mottled, has a confused sullen expression, and altogether presents a shrunk and deadly aspect. The skin is generally not elevated in temperature, but for the most part slightly chilled; which, as the disease advances, becomes more marked, and gives to the finger while touching it a most repulsive sensation. It early assumes a slight livid colour, which rapidly increases to a deep leaden hue at the point of the fingers, tips of the ears, &c., and in many parts patches of a deeper and more putrid character show themselves. The pulse is small, intermitting, and eventually almost imperceptible. There is throughout the attack not the slightest evidence of any vascular excitement. The tongue is swollen, smooth on its surface, of a red or livid colour, and covered here and there with foul white patches. The stools, if passed, are white, and the urine is almost entirely suppressed. The respiration is laborious, and the black vomiting, accompanied by hiccough, sets in early. Few who are thus attacked recover; many die in the first twenty-four hours; others go on to the third day.

[The following is a summary of the symptoms observed by Dr. Louis, during the Gibraltar epidemic of 1828.* Dr. L. gives, *first*, the symptoms met with in the fatal cases; *secondly*, those of the severe cases which recovered; and *lastly*, those presented in the mild cases.

* [In 1828, an epidemic of yellow fever occurred at Gibraltar. The French government sent a commission, composed of Drs. Gendrin, Louis, and Trousseau, to investigate it. The commission arrived there thirty-three days before the termination of the epidemic. Dr. Louis drew up an elaborate report, which was translated by Dr. G. C. Shattuck, of Boston, and published in 1839. The original has since been inserted in the second volume of the Memoirs of the Medical Society of Observation of Paris. It should be borne in mind that the work professedly records only the observations made in a single epidemic, and that, too, at an advanced period.]

1. *Fatal cases.*—These commenced with an intense headache, accompanied with chills, shivering, pain in the limbs, and, soon after, pain in the back. A heat, rarely intense, succeeded to the chills, and was sometimes followed by perspiration. At the same time the countenance became red and animated, and in some cases swollen. The eyes were red, glistening, suffused, and patients often complained of a sensation of smarting in them. The thirst was intense, the anorexia complete. Pain at the epigastrium usually came on in fifteen or twenty hours from the commencement of the disease. It was generally inconsiderable, and very few patients complained of severe or acute pain. With the epigastric pain came nausea and vomiting, excited by drinks and purgatives in several cases, spontaneous in others. The dejections were infrequent, that is, where no laxatives had been administered. The abdomen preserved its form, was supple and not painful to the touch, except in the epigastric region. The sleep was inconsiderable, some patients were restless, and in some there was a good deal of jactitation during the night. The smaller number experienced, as early as the third day, a real anxiety, could not remain in any posture, and in some cases there was delirium; but this symptom did not usually come on till the last day of life, and for this reason is rather to be considered as belonging to the agony than the disease. Otherwise, with few exceptions, there was neither prostration nor stupor. The pulse was moderately accelerated, regular, generally bearing relation to the degree of heat, which was generally slight. The skin of the thorax was injected in some cases. This redness and that of the eyes diminished towards the middle period of the disease, or a little later, and new symptoms appeared. To the injection of the integuments of the chest there succeeded a slight yellow tint of that part, and the eyes were of the same colour. When this colour appeared thirty-six or forty-eight hours before death, it became rapidly brighter, so as to be of some intensity at the time of the fatal termination. In other cases where it came on only just before death, it was slight at the autopsy, and commonly limited to the trunk. About this period, or a little later, the matter vomited, from being of a yellow colour, became brown or black, and the dejections blackish or black. At this period of the disease, the uncomfortable feelings and the anxiety continued during different lengths of time and in different degrees; the strength diminished, the temperature fell, so that the limbs were cold before the agony, and in a certain number of cases there was suppression of urine. Yellow fever resembles other dangerous febrile diseases in an occasional mildness of external aspect even in fatal cases; the slightness, as Dr. Louis observes, of the fever, and of the pains wherever seated, the absence of agitation and delirium, and the little diminution of strength im-

pressing on the disease a character of mildness calculated to deceive at once the patients, their attendants, and the physician. It was under this form of disease that patients died without taking to their beds, on foot, as it was expressed by their friends. The severity of the symptoms did not always correspond with that of the lesions.

2. *Severe cases in patients who recovered.*—The early symptoms differed in degree only from those in the fatal cases. In some subjects the stools became black, and in a few, and these mostly children, the brown or black vomit occurred. In a great many cases there was no yellowness, and in the majority of cases where it was found it came on from the fourth to the sixth day of the disease. The extreme restlessness, the jactitation which took place in those who died was not met with in any of the cases now under consideration. Towards the fifth day, the symptoms became less severe, the skin cooler, the pulse calm, the epigastric pain diminished or totally disappeared, the thirst was less, the appetite returned, and convalescence commenced.

3. *Mild cases.*—These began with the usual symptoms very slight in degree. In the progress of the complaint the epigastric pains were rare, and so too were the vomitings, which were almost never spontaneous, and which in no case were of a brownish colour. So slight was the diminution of strength, that the patients either did not keep their beds at all, or were there for half a day only, thus, to use their own expression, going through the disease on foot.* In several of these cases the febrile symptoms were very slight, continuing only during twenty-four or thirty-six hours: yet these persons were exempt from any other disease in the course of the epidemic, though exposed to all the causes which could have produced in them the yellow fever, and it was likewise remarked that persons who had been thus slightly affected in the epidemic of 1804 passed uninjured through the epidemics of 1818, 1824, and 1828. This mild form was principally observed in children.

Dr. Ashbel Smith, of Texas, published, in 1839, a very graphic account of an epidemic of yellow fever which had just

* [These cases Dr. Rush used to call the "walk about" cases, in which the patients scarcely feel or acknowledge that they are ill, refuse to go to bed, and are unwilling to be subjected to treatment; with hardly an exception they sink and die promptly. Dr. Dickson, of Charleston, mentions the instance of a stout, fresh New Englander, an engineer of one of the steamboats, who retained, to the moment of his death, his uncommon muscular strength, and his florid, ruddy complexion. "It was singular," he says, "to see him, indeed, going about from room to room, and into the piazza, when, from the urgent irritability of his stomach, he was obliged to carry with him a vessel to receive the black vomit, which he threw up frequently and in large quantities."*a*]

a [Practice of Physic, vol. i., p. 351.]

occurred at Galveston, in that state.* Between Dr. Smith's description and that of Louis, there is the closest resemblance. There were first pains in the limbs, some sickness at stomach, chills not amounting to complete rigor, and some diminution of the sensibility of the extremities. In a variable period, ranging from two or three minutes to a few hours, there succeeded pain in the forehead and eyes, pains in the loins, great restlessness, bloodshot eyes, flushed face, hot and dry skin, and full and frequent pulse; whilst the pains in the limbs and the sickness of the stomach, which were present at first, still continued. The tongue was moist, and sometimes furred and swollen, but not unfrequently of a healthy aspect. The thirst was often moderate, in some cases considerable, never intense; the epigastrium was slightly sensible on pressure in some cases, in others quite free from pain. The mental operations were generally coherent, but sluggish. The restlessness did not consist in jactitation, but in a disposition to rise from bed and walk about. A diminution of pain and febrile excitement very generally takes place from eight or ten to twenty-four hours after the invasion. If the disease proceed to a favourable termination, this abatement is progressive, and convalescence takes place at a period varying from the third to the fifth or seventh day, or in one case the fifteenth day.

Dr. Imray, of Dominica, has recently given an account of the epidemic in that island in 1843.† He says:—The commencement of the attack was without rigors, seldom even with chilliness, and usually very sudden, with great prostration of strength, intense lumbar pains, extending along the thighs, extreme restlessness and anxiety. The headache was of a peculiar character, differing from this symptom as usually met with in the common fevers of this country. The pain, generally very severe, was confined, in most cases, to the temples and occiput; sometimes the forehead was affected, but pain was rarely experienced in the coronal region. On the second, third, or fourth day came the subsidence of all the acute symptoms, freedom from pain, cool skin, slow pulse, yellowness of surface, followed in a longer or shorter period by bleeding from the mucous surfaces, the deadly black vomit, or cerebral and nervous symptoms, equally certain forerunners of death. In every instance there was yellowness of the skin, the yellow tinge appearing about the second day.]

Such are the more ordinary forms which yellow fever as-

* [An Account of the Yellow Fever which appeared in the city of Galveston, Republic of Texas, in the autumn of 1839, with Cases and Dissections. By Ashbel Smith, M. D., A. M., Ex-Surgeon-General of the Texian Army. Galveston, Texas, 1839: 8vo., pp. 78.]

† [Observations on the Nature, Causes, and Treatment of Yellow Fever, as it prevailed in the Island in 1841. By John Imray, M. D., of Dominica.—*Ed. Med. and Surg. Journ.*, vol. lxiv., No. 165, Oct., 1845, p. 321.]

sumes, each of which presents occasional variations, but they are not accompanied by such marked characters as to require particular description. One variety, however, may be noticed, as it has by many writers been considered a separate disease; it has been described under the names of the *African endemic fever*, the *climate* or *seasoning fever*, &c. Dr. Stevens, who very decidedly advocates the view of its being a distinct disease, describes it as differing from yellow fever in being indigenous, and in not being contagious, as he esteems the latter to be; that it is only met with as an epidemic during the hot months, when the thermometer is upwards of 88° during the day, and at least 80° during the night. It occurs generally in dry situations, very seldom in swampy districts, and only in solitary cases, except in those localities where there is an accumulation of unseasoned strangers, exposed to the action of a burning sun. He further states this disease to be confined to the whites, and almost entirely to those who have arrived lately from northern countries; while the African typhus, as he terms yellow fever, appears in the West India islands in every locality and at all seasons of the year. It is not confined either to the whites or to those who have lately arrived; he has known it just as fatal to the negroes and creoles, who have never been out of the tropics, and equally mortal in the coolest weather as in the hottest months. He says it can easily be distinguished from yellow fever, from there being no marked premonitory symptoms, no cold stage in the commencement, no foulness of the tongue, no sickness or irritation in the stomach, at least for the first twelve hours after the attack, no derangement in the biliary organs, no spasms in the gastrocnemii muscles. All the secretions are diminished, but there is no redness in the urine: the pulse in the first stage is not only incompressible, but the artery at the wrist is distended to a degree which is never met with in any other disease. He likewise states that, though in the climate fever the blood is diseased, it is not unnaturally dark in colour before the attack, which he states to be the case in yellow fever. Notwithstanding these strongly expressed opinions, it does not appear from other evidence that there is that dissimilarity which should entitle the so-called endemic disease to be separated from yellow fever. It appears from the observations of many who have had ample opportunity of satisfying themselves upon this point, that they are essentially one disease, only occurring under certain modifications. It is not a little singular that Boyle, who advocates the view of their being separate diseases, after describing at large the endemic fever, says, that the general character and symptoms of the epidemic, *i. e.*, the yellow fever, bear so strong a similarity to those of the endemic fever, that it seems to be only necessary to refer to the description of the latter. We are inclined to believe that the climate fever is

the ordinary fever of the country; and that, when it assumes an epidemic severity, it acquires those characters which are peculiar to yellow fever.—[See p. 84.]

The nature and origin of the fluid discharged from the stomach, so characteristic of this disease, and which has been technically called *black vomit*, have been very differently viewed by writers. On the first appearance of this discharge it has a turbid reddish-brown appearance, is insipid and perfectly inodorous, and settles at the bottom of any fluid with which it may have been mixed in the stomach. It presents an appearance not unlike coffee grounds, and is so mingled with mucus, as to be ropy and glutinous to the feel; sometimes it is intermixed with small streaks of blood. Examined by a microscope, this coffee-ground-looking matter appears to be inorganic in its nature; when strained and dried on paper, to which it will adhere, it retains its dark brown and red colour, and exhibits the appearance of a powder, not unlike minute scales of smoky mica, both as regards colour and feel. From various experiments Dr. Cathrall concludes that the black vomit, besides a considerable proportion of water tinctured with resinous and mucilaginous substances, contains a predominant acid, which is neither the carbonic, phosphoric, nor sulphuric, but which, he hints, may be the muriatic. It likewise appears from his experiments, that when applied to the most sensible parts of the body, it produces little or no effect; that large quantities of it may pass through the stomach and bowels of animals, without apparently disturbing digestion or affecting the health; and that an atmosphere highly impregnated with its exhalation, does not produce fever under apparently the most favourable circumstances. From these facts he infers, that the speedy death which ensues on this discharge is not from any destructive effect of this matter on the stomach and bowels, but most likely from the degree of direct and indirect debility which precedes and accompanies it. (*New York Repository*, 1800.) With regard to the nature of this peculiar fluid, some state it to be vitiated and putrid bile; others, a mixture of blood and bile; some, that it is the sphacelated mucous coat of the stomach dissolved in a morbid secretion of this organ; others conceive it to be a morbid secretion from the liver. The view of Dr. Fordyce appears to be the correct one, viz., that it is identical with the incrustation on the tongue, gums, lips, &c., in violent fevers, and that, probably, it is an exudation from, and is formed upon the surface of the stomach, and perhaps of the duodenum, or even the beginning of the jejunum. It is probably nothing but broken-down blood, which oozes from the secreting surface of the mucous membrane in place of its natural and proper secretion. The force of the exertion in vomiting often occasions a considerable

quantity of bile to be secreted, which, being thrown back into the stomach, is brought up with the dark brown matter. When this happens it gives to the fluid the taste and appearance of bile.

[The following interesting remarks on the nature of black vomit by Dr. Josiah C. Nott, of Mobile, will be found in an instructive paper contributed by him to the *American Journal of the Medical Sciences*, for April, 1845. "It cannot, I think, be a secretion," he says, "because it is most commonly seen in little particles or masses of various magnitude which could not pass through a secreting capillary, and my own opinion is that the black vomit is *blood*, exhaled in its natural state from the capillaries of the stomach, intestines, and even the bladder, and changed black by the secretions with which it comes in contact; this chemical change, my facts go to show, is produced by one or more acids. With the assistance of my friend, Dr. P. H. Lewis, I have tested the black vomit in a considerable number of cases this summer, (1844,) and in every instance I have found it to be acid; when ejected from the stomach during life, it invariably turned litmus paper red, and the aqueous portion of that which was taken from the stomach after death and filtered, in several cases effervesced strongly with carbonates. The aqueous portion thus filtered, differed in colour; in some it was perfectly limpid like water; in one of a light green colour like dilute bile with an acid added, and in others, it was of a deep brandy or rum colour; which appearance was no doubt given by a small admixture of blood. The secretions of the stomach in yellow fever are often excessively irritating, and this property is probably attributable to the presence of acid; the patient often complains, in the black vomit stage, of a burning or scalding sensation in the stomach, which is immediately relieved by throwing off its contents. The patient, too, often complains of the black vomit scalding the œsophagus, which, after death, is usually found more or less denuded of its epithelium. The acridity of this secretion may possibly account for many of the morbid changes in the stomach and œsophagus. A morbid secretion of tears will scald the cheek; mucus from the nose inflame the lip; morbid secretions from the bowels excoriate the *anus;* morbid bile irritates the stomach and bowels, &c., and we know that the gastric juice will often corrode the stomach in a short time after the extinction of life. The next step was to ascertain whether acids would with blood produce a compound with the characters of black vomit. I accordingly took a few drachms of blood from the heart of a patient dead of yellow fever, and added to it four or five drops of muriatic acid, diluted with a drachm or two of water, and shook them well together; the black colour was produced instantly. The same experiment was tried repeatedly on the blood of yellow fever patients, and on that drawn from a patient with pleurisy by cups,

and the effect was invariably the same. Any one wishing to form a correct idea of black vomit, has only to treat blood in this way, and add a little gum water or flaxseed tea to represent the mucus of the stomach, and his curiosity will be gratified; no one can tell the artificial from the genuine black vomit. Sometimes the blood, after passing through the exhalents minutely divided, is coagulated in little particles, which, when blackened, present the appearance of coffee grounds; this appearance is difficult to imitate in the artificial black vomit, because we cannot readily produce these small coagula. I presume other acids will produce the same effect as the muriatic and crystalized acetic [citric?], the only acids which I experimented with. We have then established two important links in the chain; the black vomit in the yellow fever of 1844 was acid, and acids turn the blood black. Whenever, in yellow fever, blood is exhaled from the mucous coat of the stomach or bowels in small quantity, *a quantity proportionate to the secretions of these surfaces, it is (according to my observations) invariably found black, and the aqueous portion limpid or clear green.* If there be a slight excess of blood (more than enough to neutralize the acid) instead of black, we find a nut brown, a chocolate or reddish matter, and the watery portion, when filtered, of a rum, brandy, or red colour. If the hemorrhage be great, we have (as I have often seen vomited) a fluid with all the characters of blood, either with or without a mixture of black vomit. I have often seen a tablespoonful or two of the 'coffee grounds' at the bottom of the basin with a pint or more of pure blood; this I have several times pointed out to others. In the case of Mr. Covert, whom I saw with Dr. Mordecai, I had presented to me at one time three basins, each containing a full pint of blood with the black vomit intermixed and lying at the bottom. As an additional proof that the black vomit is blood, changed by the secretions of the stomach and bowels, I will state that I have never seen red blood, in yellow fever, tangled with mucus; when thus mixed it is always black. This exhalation of blood and chemical change is by no means peculiar to the stomach, but evidently takes place over the whole mucous surface of the canal. I could cite many facts to prove this, and abundant evidence will be found in the work of M. Louis. I have frequently seen black matter, like black vomit, in the urine, and it is formed no doubt in the same way, by blood combined with an acid in the urine, or in the mucus of the bladder. Dr. Lewis and myself are at this moment attending a medical gentleman (Dr. Fletcher) in whom this formation has been going on for some days, and at the same time the patient is throwing up black vomit and purging pure blood from the bowels. There are many facts connected with other diseases, and analogies which would throw light upon this interesting subject, but I must

touch them lightly for want of space. Blood which is vomited or purged in other diseases, after being retained in the alimentary canal (in contact with the secretions) is usually very dark, and not unfrequently black. In hæmoptysis the blood, on the contrary, is usually *florid*, and we are told by many that in the one case the blood is venous, and in the other arterial; but the blood in the two cases is doubtless exhaled from the same set of vessels, and the difference can only be accounted for by the chemical action of the gastro-intestinal secretions. We know that in the vomiting of pregnancy, little specks or streaks of blood are frequently thrown up, and when females in this condition are attacked with fever of any kind, accompanied with excessive and protracted vomiting, small specks or streaks of black matter, like broken-up butterfly wings, are frequently seen. This kind of vomit is the usual precursor of genuine black vomit, and has the same explanation. Every experienced physician must have seen this, and my friend Dr. Crawford yesterday related to me a very interesting case of this kind attended by himself and Dr. Mordecai; the patient (the wife of a distinguished lawyer) during the month of December last, ill of a protracted fever, possessing no other symptoms of yellow fever, and at a time and place where this disease was not prevailing, threw up black matter profusely, which could not be distinguished from the black vomit of yellow fever. We all know how abundant is the formation of acid in delicate females when pregnant. A very small quantity of blood oozing gradually in a minutely divided form, and mingling slowly with the secretions of the mucous membrane of the stomach and bowels, will make a large quantity of black vomit. Judging from my experiments, I should think a tablespoonful would make a pint. A moderate quantity of bile may exist in the black vomit without being perceived; this I proved by adding bile to the artificial black vomit, and by filtering the genuine black vomit, the aqueous part of which in one case was green, and this colour, I presume, was attributable to a small admixture of bile. Authors have gone into laboured descriptions of the *varieties* of black vomit, but my belief is, and the preceding facts go to prove that they are essentially the same, blood,—acids, mucus, and aqueous fluid, mixed in various proportions. Give me blood, muriatic (or, I presume, any other acid) and gum water, and I will make it to suit the notions of the most fastidious pathologist; perfectly black, brown, reddish, &c."

Of this constant phenomenon—by some regarded as pathognomonic—Dr. Dickson says, "Though occurring so familiarly in yellow fever as to give it a name in one language at least, it is by no means exclusively or specifically a symptom in that disease only, and of course cannot be regarded as a diagnostic. I have myself met with it in several cases of bilious remittent, and in

gastritis and enteritis; in one case of varioloid, occurring in winter; in catarrhal fever once in March; twice in dropsy, and once in the familiar vomitings of pregnancy. It attends puerperal fever occasionally, and always, I believe, follows rupture of the uterus [?]. Dr. P. G. Prideau, whose professional experience has seldom been equaled, and whose authority upon any point of fact is indisputable, assured me that he had repeatedly known it to take place among the easy vomitings of pregnant women without unpleasant results; and that he had once witnessed its spontaneous occurrence in a youth from mere fatigue, ceasing readily, and leaving him quite well."*]

It does not appear that yellow fever is particularly complicated or altered in its character by the supervention of another disease, or by its occurring when some other disease is present. Amiel says, during the time it raged as an epidemic at Gibraltar, no other acute maladies prevailed; it seemed to have the peculiarity of modifying or completely changing the nature of the acute as well as of the chronic diseases. Dr. Smith and others state, that persons labouring under other diseases at the time they were attacked with yellow fever, fell victims to it, and that this fatality appears to have been particularly marked in females in a state of pregnancy. Sir William Pym makes the curious observation, that several of those who were attacked had pulmonary complaints, and that in some cases these affections appeared to be cured in consequence.

Yellow fever may terminate in complete recovery, or the recovery may be retarded by chronic organic affections; it may also prove fatal. Though in many of the slighter cases convalescence takes place early and perfectly, yet there is very frequently the most decided evidence of organic lesions. The organs most usually diseased are the stomach and liver. The lungs, spleen and nervous system have also been observed to participate. Some writers state that it occasionally terminates in fits of ague. Amiel says that the rapid progress and the short duration of this disease leave no time for visceral obstructions to be formed; and the only sequelæ which he observed were excessive weakness, an impaired state of the digestive organs, and, as a necessary consequence, a protracted and tedious convalescence. [The infrequency of chronic disease after yellow fever is satisfactorily shown by Dr. Catel, of St. Pierre, in his account of the Martinique epidemic of 1838–39. Of more than one thousand patients discharged from the hospital, not one presented any evidence of disease likely to become chronic.]

* [Dickson's Practice of Physic, vol. i. p. 355. Charleston, S. C., 1845.]

II. ANATOMICAL CHARACTERS.

The morbid appearances observed in fatal cases of yellow fever are very various. The external appearance of the body retains, after death, much the same dusky yellow, gray and mottled colour, which has been observed during life. Such parts as are pending not unfrequently become livid, while the extremities and scrotum in males are generally of a brownish-black. A line of a pale cast of yellow, from the nose to the pubis, has been sometimes observed. The generally darkened or discoloured condition of the integuments has induced many to suppose that the body is peculiarly liable to undergo a rapid decomposition; this, however, appears to be no more the case than it is in plague. The discolorations which are apparent on the surface, do not appear necessarily to involve any other tissue than that of the skin; for frequently the cellular membrane immediately below, though said to be usually diseased, is often not in the least discoloured; occasionally, however, it is a little yellow. The muscular tissue is often darkened, softened, or even broken down; in some cases an uniform venous infiltration into the cellular tissue of the muscles has been observed.

[In those cases examined by Louis at Gibraltar, there was observable great cadaveric rigidity, and in some the muscular prominences were as well marked as they could have been during life when the muscles were in a state of strong contraction. The skin was yellow in all except three, and when the yellowness was not well marked it was more so on the trunk and head than on the limbs. The muscles had their natural colour, firmness, and cohesion. In one case the superficial muscles of the calves and hams were infiltrated with blood. That the disposition to hemorrhage was not great is shown by the fact that in one only of twenty-three cases was there a slight exhalation of blood in the subcutaneous cellular tissue and in the superficial muscles. Dr. Imray states that the yellow livid colour of the body became deepened after death, and that decomposition advanced rapidly. Dr. Ashbel Smith speaks of the peculiar yellow cadaveric hue as pathognomonic.]

On examining the head, the surface of the dura mater is found studded with dark-coloured spots, with patches of lymph here and there; there is usually infiltration of yellowish serosity, to a greater or less extent, under the arachnoid, with congestion in the veins and sinuses, though in some cases this is not very remarkable. The substance of the brain is firm and more vascular than natural, but in some very protracted cases it becomes soft-

ened. The choroid plexus is much distended, and instead of presenting its beautiful appearance looks like a clot of blood. The ventricles sometimes contain an excess of fluid. With regard to lesions in the vertebral column, Dr. Gillkrest says, that in examinations conducted on a small scale by a French medical commission sent to Barcelona during the epidemic of 1821, erroneous views had been hastily adopted as to the spine being the *fons* and *origo mali* in yellow fever; but subsequently these opinions were admitted to have been entirely, or in part, erroneous, Magendie having shown that there is in the healthy state a certain quantity of fluid within the theca. O'Halloran mentions the effusion of coagulated blood on the sheaf of the cord, for four inches in length, as it passes the lumbar vertebræ, and that the intervertebral substance was black and blue, as if from the effects of a contusion previous to death. The eye is described to be extremely hard, firm, and yellow externally.

[Louis found no constant especial alterations in the brain, and the spinal marrow presented nothing remarkable. Imray says, "The appearances presented on examination of the head were chiefly congestion of the sinuses, increased vascularity of the brain and of its membranes; the latter were in some cases thickened, and occasionally there was serous effusion in the ventricles and at the base of the brain."]

The lesions within the cavity of the chest are not very remarkable. Sometimes the pericardium contains an unnatural amount of fluid, of a pale yellow colour. The heart does not usually present any other appearance than is common in the muscular tissue generally. In the pulmonary tissue the changes observed are considered to be only accidental, though Dr. Browne says that the lungs presented, almost always, numerous dark spots externally, or were nearly uniformly of a dark colour; and the infiltration of blood into their tissue, forming what is called splenization, was very frequent. The bronchial mucous membrane was often reddish, and coated with a copious sanguinolent frothy fluid; in other instances it was pale or yellowish, as was also that of the trachea. (*Edin. Med. and Surg. Journ.*, vol. xxxv.)

[The only general morbid appearance which Louis noticed in the respiratory organs was a livid colour, more or less marked. The exhalation of blood into the pulmonary parenchyma was constant and occurred in the following forms. "There were either black spots of from two to five lines in diameter, or masses of the same colour more or less impermeable to the air, or else they were the first and still more rarely the second degree of pneumonia. The spots were found in nine subjects, sometimes without complication, sometimes with the lesion of which we have just spoken. Usually of a brown black, rarely of a crim-

son hue, they were more or less concentrated, and occupied a variable space at the exterior or in the interior of the lung, and in some cases they were found only in the lower lobe. The density of the tissue, which was the seat of them, was not manifestly increased except in two cases, this increase of density being the manifest result of an effusion of blood more or less intimately combined with the pulmonary tissue. The blackish masses existed in six individuals; their consistence was greater or less, they contained no air, they had not the granulated aspect of hepatized lung, they presented but slight traces of organization, so that merely some cellular fibres irregularly disposed might be distinguished in them. Usually they could be easily broken down; in some cases also they yielded by pressure the blood of which they were almost entirely composed, and the pulmonary parenchyma remained apparently of its natural consistence." (pp. 64–6.)]

In the abdomen, the peritoneum and omentum are often slightly injected, and of a dirty yellow colour, without the usual natural glistering appearance. The coats of the œsophagus are softened and often partially eroded, especially towards its termination; it occasionally presents an appearance, as if some of the black vomit had been poured out from its surface, as well as from that of the stomach. [Dr. Louis describes the œsophagus as devoid of the epidermis, covering its mucous membranes in six cases; it was partially wanting in nine others, and was perfect in five only. The mucous membrane was blackish or of a deep brown in six cases; red, colour of onion parings, or reddish brown in three others; of a proper thickness and consistence in all. The black colour was found only where the epidermis was wholly or partially destroyed. He does not regard the destruction of the epidermis of the œsophagus as peculiar to yellow fever.]

The stomach is usually distended by inodorous gases, and generally contains much of that peculiar dark-coloured fluid, the black vomit. Sometimes the contained fluid is pale and viscid, with flakes floating in it. Blood is occasionally effused upon its mucous surface, and sometimes small quantities are enveloped in flakes of a dirty ropy fluid. The vessels of this organ are generally gorged with blood, especially towards the cardiac orifice. The orifices of numerous canals may be seen, from which, by pressure, a dark fluid oozes, which is no doubt the *black vomit*. Dark patches of various extent and appearances are found around the cardiac orifice, with more or less of punctuated redness in the large curvature; over the rest of its surface it is of a rose shade. Occasionally it exhibits an appearance as if a bit of the mucous coat had been pinched out, but there is very rarely softening, thinning, ulceration or gangrene. [In the examinations of

Louis, the *colour* of the mucous membrane of the stomach varied in different cases and in the same case. In one case it was universally red except near the pylorus; in five others through a more or less considerable part of its surface. Instead of a red colour there was an orange or slight rose tint, or a colour of onion parings, in a varying extent, in eight others. In two cases there was a ruddy or bister hue; a greenish or yellowish in two others. The colour of the membrane was natural in three subjects only. These changes of colour were independent of the contents of the stomach; and M. Louis is of opinion that they were not much more frequent than in those who die of the acute diseases of Paris. The *thickness* of this membrane was natural in half the cases. In other cases it was thickened. Its *consistence* was normal in thirteen cases; in ten the membrane was softened. This softening, M. Louis thinks, was the result of inflammation in the majority of cases; in seven it was associated with thickening and redness. He remarks that "it is hardly less frequent after other acute diseases, but what makes it more important in this fever is the rapidity with which it took place. The disease was short, and the gastric mucous membrane was not affected in all the cases at the commencement of the fever, or at any rate according to all appearance it was not." The *mammillated appearance* was found, and usually to a remarkable degree, in fifteen subjects. In all the cases this appearance was associated with either thickening or softening, or both these conditions conjoined, and was evidently the product of inflammation. *Ulcerations* of the gastric mucous membrane were found in two cases only, a proportion not exceeding that observed in cases of death from other acute diseases. The *contents* of this organ were not the same in all subjects. Their predominant colour was red, more or less inclining to black. The duration of the disease had little appreciable influence on this colour. The red or black matter varied in quantity from four to twenty ounces, and the deeper its colour the more abundant it was. The red and black matter did not differ in consistence. The latter separated, on standing, into two parts: the one superior, more liquid, of a bister colour; the other inferior, less abundant, and, as it were, formed of blackish particles. It was not mixed with clots of blood; but M. Louis has no doubt of its containing it for the vessels in which it was kept, and bodies plunged in it were stained red. What was the mechanism of its formation? There was no vessel ruptured in the whole tract of the alimentary canal and no lesion of the gastric mucous membrane, so that it must be considered a product of the exhalation of this membrane.

Dr. Ashbel Smith's description of the condition of the stomach is as follows: "On pouring off the black vomit, which the stomach in all fatal cases contained, and detaching from the

mucous coat the adherent dark-coloured flocculi, this tissue was found of a dull pearlish white colour, thickened and softened. In some cases the softening was so great that the villous coat could be scraped in portions almost into a pulp with the fingers. The thickening was not uniform, but presented in portions *rugæ*, and an uneven surface like the 'unevenness of the rind of the lemon,' (corresponding with the mammillated appearance of Louis.) There were a few points, and some scattered stelliform particles of a bright red; but these points and patches would not, except in a single case, form, by their aggregation, a surface of an inch square. In two cases examined, the whole mucous coat presented the white, much thickened and softened condition above described: but in four cases, from three-fourths to five-sixths only presented this condition commencing at the pylorus, and terminating within two inches of the cardiac orifice, whilst the remaining portion, surrounding the cardia, was the seat of a most intense, diffuse red injection, preserved its usual firmness, was but little, if at all thickened and entirely destitute of flocculi adherent to the surface. This injection did not present pointed or stellated patches, but the blood appeared to be diffused throughout the mucous tissue, and the colour was more or less intense, in proportion to the quantity of blood contained in the different parts, and the hue was that between venous and arterial blood. The line of demarkation between the pale or colourless and injected portions of the mucous coat, was, for the most part, as well defined by the different thickness of the two portions as by their different colour; the white portion being thickened, whilst the red and engorged part still preserved its normal thickness."*

At the epidemic at Dominica, in 1841, according to Imray, the mucous membrane of the stomach presented patches of inflammation or congestion of greater or less intensity, and was sometimes thickened. The stomach in every instance examined contained black vomit. In one case as much as 14 oz. was collected.]

The small intestines participate somewhat, in the lesions which are observable in the stomach. Externally they exhibit, to a greater or less extent, vascular arborizations, and are generally of a yellow tint; internally, they contain a dark fluid, not unlike that which is found in the stomach; this in the lower intestines becomes of a thicker consistence; the villous surface is covered with the viscid mucus; and here and there, but especially in the duodenum, patches of a spotty redness may be observed. There is rarely, if ever, ulceration or disease of the glands of Peyer. The larger intestines usually contain a quantity of pultaceous black matter. No particular changes, however, are discoverable in its mucous membrane. [In the Gibraltar epidemic

* [Ashbel Smith, loc. cit.]

the mucous membrane of the small intestines was slightly softened in a few cases, but, in the opinion of Dr. Louis, this softening was not, in most instances, of an inflammatory nature. In one case Peyer's glands, near the cæcum, were slightly tumefied. As in the case of the contents of the stomach, those of the small intestines were of various appearances. There was in one case a yellowish liquid, a more or less viscous and abundant one in five others; a reddish, brownish, blackish, or even entirely black matter in fifteen subjects, and blood, recognizable by all its external characters, in another. The author is of opinion that the stomach is the main source of the black matter, and that it passes thence into the intestines; but in some cases he thinks it was the product of exhalation from the mucous membrane of the intestines, since it was found there in two instances, when there was neither red nor black matter in the stomach. Black matter was present also in the large intestines. Dr. Smith found the glands of Brunner and Peyer frequently enlarged and "sometimes greatly developed."]

The appearances presented, both externally and internally, by the liver, are very various; it is generally enlarged, heavy and gorged with blood; often soft in texture, and easily ruptured. O'Halloran, however, describes it in several dissections to have been yellow and hard externally and internally, so destitute of blood and dried up, as it were, as literally to crumble beneath the fingers. Gillkrest mentions much the same appearance; he says, that on making deep incisions into its substance, little or no blood exuded; and when broken up between the fingers, the impression given was what is termed friability of texture. Scarcely any trace of bile is to be found throughout its pores. [The lesion of this organ found in those dying of yellow fever at Gibraltar, Dr. Louis regards as peculiar to the disorder and as constituting its anatomical character. He describes it as an alteration of colour, the organ being sometimes of the colour of fresh butter, sometimes of a straw colour, sometimes of the colour of coffee and milk, sometimes of a yellowish gum colour, or finally an orange or pistachio colour. This discoloration was not the same through the whole extent of the liver; more marked in the left than the right lobe: it was also more uniform. In cases in which the colour was uniform in the left lobe, there was a mixture of gum-yellow, orange, or red points, larger or smaller, in the right lobe, or else a rose tint, which did not exist in the left lobe. With this discoloration were associated a marked paleness and a diminished quantity of blood, so that wherever this appearance of the liver was decided, the sections of it were dry and of an arid appearance in the left lobe. This pale and anemic state of the liver was unaccompanied with softening, indeed in several cases was associated with increased consistence of the organ.

Though Dr. L. deems it impossible, in the present state of science, to determine the nature of this alteration, he decides, from the circumstances just enumerated and the liver being of a natural size, that it is not of inflammatory origin. He assigns sufficient reasons for the conclusion that this anemic condition is the effect neither of hemorrhage from the intestinal canal nor of a derivation produced by the inflammation of the mucous membrane of the stomach or duodenum. He considers its commencement cotemporaneous with that of the disease, or that it occurs shortly after it. It is remarkable that no other organ is in the same anæmious condition, and that many of them, as the lungs and stomach, contain a larger quantity of blood than usual. In the epidemic at Dominica, in 1841, this condition of the liver was invariably present. Dr. Catel, of Martinique, found it in all the cases that he examined—one hundred and fifty—in the epidemic of 1838–39 of St. Pierre. In the same epidemic Dr. Rufz met with it in two out of three cases. Dr. Ashbel Smith says, "the liver was found in all cases of its usual dimensions, of ordinary firmness, and without any obvious structural change. In three cases it was of a very light drab colour, externally and internally, and destitute of blood; in one of a dark claret colour, and congested with blood, and in the others of its usual appearance, and containing a moderate quantity of blood. In all cases there appeared to be a suspension of the biliary secretion; no bile could be squeezed from the substance of the liver." Dr. Nott says, "of 8 cases dissected during the epidemic of 1843, in Mobile, the livers in two only corresponded with the description of M. Louis—they were pale, and when torn resembled very closely gingerbread or new leather; and the six others were of a dark blue or dark chocolate, presenting different shades of colour, and instead of being dry, they were excessively engorged with blood; the latter cases correspond with the description given by Dr. Hulse, of the cases dissected in the Marine Hospital at Pensacola in 1841: of the 8 dissections in 1844, the livers in 4 corresponded with the description of Louis; 2 were of a dark olive, and 2 were perfectly natural. Taking the whole 16 livers collectively, six were some shade of yellow, dry and friable; 2 olive; 2 normal, and 6 darker than natural and much engorged. There can be no error in these facts, for Louis' liver was our standard for comparison in every case." Dr. Nott thinks that Dr. Louis has fallen into "another error in supposing this liver to be peculiar to yellow fever—I have repeatedly seen facts to the contrary, and two of them have occurred this summer (1844)—one a man by the name of Sandy White, who was walking about during the day and died at night with violent pains in the bowels; poison was suspected, and the body was opened by several physicians. The other was a Frenchman, who was brought from three miles in

the country into the city hospital, dying with protracted bilious fever. In both these cases the straw-coloured liver was found, without any trace of black matter in the stomach or bowels, or other mark of yellow fever." Professor JACKSON, in the yellow fever epidemic in this city, in 1820, found the liver to vary in appearance, never constantly presenting the same aspect. It was usually gorged with blood. It is stated, on the authority of the late Dr. PHYSICK, that in the previous epidemics in Philadelphia, the liver was rarely found much diseased.] The gall-bladder is sometimes empty and contracted, at other times distended with a grumous mass like tar or molasses; sometimes it contains a minute quantity of orange-coloured bile, serum, or pulse: its coats are usually very vascular. The biliary ducts are almost invariably pervious, with the exception of the cystic, which has occasionally been found closed. [LOUIS found the bile in the gall-bladder scanty, thick, and of a dark green colour. Dr. NOTT states that the gall-bladder contained bile in all his cases but one; that it varied in quantity from half an ounce to four ounces; its colour was from pale green to olive, and even black; and of consistence from water to tar. In one case the gall-bladder contained about four ounces of colourless fluid, resembling gum-water or mucus.]

The spleen is usually increased in volume and softened. [LOUIS found the spleen natural in one half of the cases; in some it was a little enlarged, in others softened, but slightly so with but one exception.]

The kidneys are, for the most part, of a yellow colour: internally they exhibit signs of congestion, and, on minute examination, very small abscesses, of which the papillæ are the seat, may sometimes be discovered. The ureters very generally contain pus. The urinary bladder is usually contracted, and its coats thickened and hardened; its internal surface is covered with yellow mucus, and, at times, its vessels towards the neck are surcharged with dark-coloured blood. [In two of Dr. NOTT's examinations he found black matter like the black vomit in the bladder, and in these the contained urine was bloody.]

Though these different lesions are most usually met with after death from yellow fever, it must be borne in mind, that occasionally this disease proves so rapidly fatal, that few or none of them may be discovered. Under such circumstances there has not been time for their development.

III. STATISTICS.

THE mortality of yellow fever at times is frightful, and most uncontrollable. On the first appearance of an epidemic, nineteen out of twenty of those attacked die. Nevertheless, the number of

deaths at this early period is not great in proportion to the whole population. As the epidemic progresses, the mortality becomes less in proportion to the number attacked, but greater in proportion to the population; and diminishes in both respects as the epidemic declines.

[At Gibraltar, in 1828, according to the calculation made by the French Commission, from 600 cases, the mortality was in the proportion of one to six and a half; whilst, according to the tables prepared from the published bulletins of the authorities, including all the patients in the city and hospitals, the mortality was much greater, being 1183 out of 5383, or about one to four and a half. At Port Royal, Martinique, between the years 1820 and 1827 it varied, in different years, from one in two and a half to one in five. In 1838 it was one in six. In 1804, in Gibraltar, out of a population of nine thousand civilians, but twenty-eight persons escaped an attack, and the deaths amounted to more than one in three. Musgrave gives a scarcely less terrible account of it in Antigua in 1816. In Jamaica, according to Dr. Hume, three out of four died. In Philadelphia, in 1820, eighty-three out of one hundred and twenty-five perished, or about two out of three. In the same year, at Xeres de la Frontera, in Spain, the loss was 70 per cent.*

At Gibraltar the degree of malignity was very uniform. In September 950 persons were ill, of whom 150 died; in October 3050, of whom 703 died; in November 1040, with 251 deaths; and in December 175, and 47 deaths.]

Individual liability to the disease is very much influenced by age, sex, constitution, and occupation. The susceptibility and mortality are greatest in youth and robust manhood; nearly half those attacked are between the ages of fifteen and forty-five. This may, in some respects, account for the dreadful mortality which has occasionally taken place among the troops and seamen sent to districts liable to the disease. On the other hand, children, old people, and persons of weakly constitution frequently escape. According to Townsend, of 16 cases which occurred at New York, 5 were between the ages of 1 and 10; 17 betwixt 10 and 20; 40 betwixt 20 and 30; 40 betwixt 30 and 40; 36 betwixt 40 and 50; 15 betwixt 50 and 60; 6 betwixt 60 and 70; 2 betwixt 80 and 90. Of this number, six only were coloured persons, of whom three were blacks and three mulattoes. Of the whole number fifty-nine were females; the mortality amongst whom, in reference to men, was as one to three. From the above table it appears that two-thirds of the deaths occurred between the ages of 20 and 50; and that of the remainder, nearly as many were under 20 as above 50: there were more than three times as many between 10 and 20, as between 1 and 10; and nearly twice as many

* [Dickson's Practice of Physic, vol. i., p. 352.]

between 50 and 60 as between 60 and 90. It is a little remarkable, that very nearly the same numbers died between the ages of 20 and 30, 30 and 40, and 40 and 50.

Females are not only less susceptible of the disease, but they are rarely attacked with the more severe forms: it is in them generally mild, unless during pregnancy, when it is almost invariably fatal.

[At Gibraltar the mortality was found to vary according to age and sex. The ratio, as stated by the Commission from the documents they collected, was:—of children attacked one in seven only died; of women one in five and a half; of men one in four and a half.]

With respect to constitution, persons of a plethoric habit are more liable to it than those of lax fibre. General observation has shown that Europeans, or those of northern latitudes, are, on their arrival in places where yellow fever is endemic, more susceptible of its influence than natives, which is an additional explanation of the excessive mortality among the troops sent out to such situations. The immunity from the disease enjoyed by the natives and residents of those climates is lost if they leave for a period and again return, as they are found to be equally subject to attack as the new settlers. The heat of the body in new comers to the West Indies, has been observed by Dr. M'Kittrick to be between three and four degrees higher than in the natives. This fact may, in some measure, account for the predisposition of new comers to yellow fever.

With regard to occupation, bakers and cooks are particularly prone to severe attacks, while butchers, tanners, soap and candle-makers enjoy, in some degree, immunity: the same has been observed among those engaged in potash and soda works in New York.

Yellow fever may be said to be proper to places situate between 40° north and 20° south. It appears to require a climate in which the mean summer range is not less than 75°; and, according to some authors 80°. Dr. Smith says, that temperature has evidently a more marked share in checking the disease than winds or rains, for that frequently, during an epidemic, storms have occurred without producing any perceptible effect; but the moment the temperature becomes reduced, the fever subsides, and in one night, sometimes, the generation of the febrific poison may be said to cease.

The history of many other places is also a proof of this. In the West India islands it is rarely found to occur in the cooler climates, which the elevation of 1600 feet affords. At Stony Hill in Jamaica, which is 1300 feet above the level of the sea, and has a mean annual climate of 70°, this fever is only of occasional occurrence,

and rarely epidemic. At the same time it does not follow that it occurs in all places which have a temperature ranging about 80°; or that in places where it is endemic, a year of peculiar heat necessarily gives it this epidemic character. On the contrary, the opposite is often the case, of which many striking instances might be quoted. It appears, also, notwithstanding the statement of Dr. Smith just referred to, that the epidemic increases in a quiet state of the atmosphere; while, during the prevalence of gales, tornadoes, and other climatorial convulsions, this fever rarely prevails.

To enumerate the situations in which yellow fever occurs, would include almost the whole catalogue of places with a mean temperature of 75°, whose shores are washed by the seas between the latitudes we have mentioned. It is the devastating pestilence of the places which come within this scope in America, in the West Indies, in Europe, and in Africa.

IV. PROGNOSIS.

In forming an opinion of the probable result of yellow fever, the character of the prevailing epidemic, the age, constitution, and residence of the patient should be taken into consideration. The symptoms which augur an unfavourable termination are, general depression supervening immediately on the attack, or occurring suddenly in the progress of the disease; an early yellowness, and especially an olive or dark tinge of the skin; coldness of the surface; weak irregular pulse; tendency to faint; deep sighing; constant vomiting; small whitish stools; suppressed urine; tremors; subsultus tendinum; coma and singultus; red, injected, protuberant eyes; dilated pupils; offensive breath; petechiæ and vibices; and dark involuntary evacuations by urine and stool. The black vomit is generally a fatal sign, though many have survived this symptom.

[Dr. Dickson says, "The individual prognosis is much varied by circumstances. The attack is apt to be violent, and its progress hasty, in the sanguineous and plethoric. For the intemperate there is almost no hope. National habits and modes of life have a decided influence. The Irish, Germans and Scotch afford us the worst cases; Spanish, Italians and Frenchmen are very apt to recover. Midway stands the Englishman, the northerner, and the mountaineer, or inhabitant of our interior country. Generally speaking, the more recently a stranger has come here, the more severe his attack. Among the young children assailed the ravages of this pestilence are very great. Rush notices the large mortality among them in Philadelphia, in 1793; and the mothers of Charles-

ton long remembered with tears the unhappy summer of 1817."* At Dominica, Dr. IMRAY observes that, with few exceptions, the fever was confined to the European population, the symptoms being modified and in general rendered milder by a residence of some years in the colony. Of twenty-eight creoles that Dr. RUFZ treated at St. Pierre, two only died, whilst at the Marine Hospital the mortality was one in five. A moist and relaxed skin was regarded by RUSH as an unfavourable sign, an opinion in which Dr. DICKSON coincides. A spontaneous suppression of urine is almost uniformly a fatal sign. Dr. IMRAY, speaking of the supervention of fatal symptoms, says, "a quivering of the muscles of the face is observed; a few clots of blood escape from the gums; and mucus, mixed with dark flakes, is coughed up; these phenomena are the almost certain precursors of death."† He adds that, in the epidemic of 1841, there was no instance of recovery after black vomit appeared, but that more cases with bleeding of the gums recovered than in 1838. Dr. DICKSON has not found the occurrence of black vomit invariably mortal, as he has seen ten instances in his own practice of recovery after it had appeared. Dr. LOUIS remarks that the same symptoms have not the same value for prognosis at all periods of life; thus the black vomit, which in men was the most certain harbinger of death, took place in a great many children who recovered.]

The favourable symptoms are, the pulse maintaining a degree of strength after the third day; a soft skin of moderate temperature; the absence of vomiting, and of severe pain of the eyeballs; free perspirations; abundant secretion of high-coloured urine; bilious diarrhœa, especially if followed by quiet and refreshing sleep. The appearance of the cutaneous efflorescence, called *prickly heat*, is also favourable.

[The supervention of some degree of febrile excitement after the subsidence of the original paroxysm, is favourable, and is spoken of by Dr. ROBERT JACKSON, as "a new stream of life," for it is at this stage that sudden and fatal collapse is so apt to occur.]

Though, speaking in general terms, these signs form sufficiently accurate grounds of prognosis, yet they are not always implicitly to be depended on: sometimes, when the worst consequences may be anticipated, a change takes place, which is followed by perfect recovery; at other times, when everything appears favourable, some peculiar state suddenly ensues, which rapidly places the patient in danger.

* [DICKSON's Practice of Physic, vol. i., p. 353.]
† [IMRAY, loc. cit., p. 329.]

V. DIAGNOSIS.

It would be almost impossible to describe, in a few words, any very particular or well-marked symptoms, by which yellow fever can be sufficiently distinguished from some of the diseases with which it is nearly allied, and may be confounded. In order fully to appreciate the differences between them, their whole phenomena should be studied. The statement of Mr. Amiel is very just, that this fever has no specific character, no appropriate essential, or pathognomonic symptom, no definite duration; but that its prominent features are, pain in the head and loins; strong and quick pulse; turgidity of the vessels of the conjunctiva; moral and physical prostration; sensibility and irritability of the epigastric region; anxiety; dry red tongue; yellow tinge of the skin; great variation in the urinary secretion; passive hemorrhage from the nose, tongue, gums, and bowels; dark or even black vomitings or dejections; delirium, coma, &c. The whole or part of these symptoms appearing together, form the most sure diagnostic of this fever.

[In severe and fatal cases the diagnosis of yellow fever is easily made. In mild cases, especially where there is no declared epidemic, the diagnosis is often extremely difficult. Dr. Louis says, in mild cases, all the more or less characteristic symptoms were often wanting. Frequently there were no vomitings of any kind, never black vomit, nor black dejections, nor yellowness, nor anxiety. The disease appeared to consist of some slight febrile symptoms, to which were joined a more or less intense headache, pain in the limbs, back, and loins; sometimes, usually even, redness of the eyes; a weakness so moderate, that many patients did not keep their beds. In cases of this sort, occurring at the commencement of an epidemic, the character of which has not been recognized, and where the patients observed are isolated, it is not only impossible to recognize the disease, but we should scarcely even suspect it. It might be taken for an ephemeral fever, the character of which cannot always be determined, or in cases where the febrile symptoms are accompanied by epigastric pain and nausea, the disease might be considered a slight gastritis; and although, according to observation, the return of strength does not take place in yellow fever patients after a space of time proportioned to the symptoms and duration of the fever, still so many causes may retard convalescence from the most common diseases, that yellow fever could not be suspected from this consideration alone. But if many similar cases were observed in a short space of time, in the months of August and September, and in the latitude where the yellow fever prevails;

if the eyes were injected from the commencement, the countenance red, the headache intense, the epigastrium sensible on pressure, we should strongly suspect this disease, although the existence of an epidemic has not been declared. There would be no doubt as to this point, even if the symptoms existed in the slightest degree only, where the disease attacked all the members, or the greater part of the members of one family, and in a short space of time; since, of diseases of this kind there is no other than yellow fever, which would attack a great number of persons of the same family in so short a space of time.]

We have previously referred to the opinion which has been entertained, that distinct remissions are a part of the phenomena attendant on this disease. In consequence of this, Dr. Pinckard and many others regard yellow fever to be not a distinct or specific disease, but merely an aggravated degree of the common remittent or bilious fever of hot climates, rendered irregular in form, and augmented in malignity, from its occurring in persons unaccustomed to the climate. In this view they think they are especially supported by its exhibiting so great instability and variation of character. We have, however, previously shown, that there is every reason to conclude, that yellow fever is not attended by a perfect and distinct remission; and that, although many conceive it to be more nearly allied to the remittent than to any other type of fever, it is in the absence of remittence the chief difference consists. Dr. Stevens states as a diagnostic distinction, that in remittent fever the blood, when drawn at the commencement of the attack, is both buffed and cupped, which is not the case in yellow fever; that in this latter, though there may be a very low state of the temperature of the body, there is never any rigor; that the patients do not shake nor tremble like those who are under the influence of the marsh poison; and that there is an expression of the countenance which is peculiar to it; which, though not so marked as the expression in tetanus, is yet so distinct, that those who have once seen it can easily recognize it.

[The distinction between yellow fever and severe bilious remitting fever is thus ably traced by Dr. Stewardson. In yellow fever, "the fever is generally, if not always, of the continued type; and hence this feature alone would be sufficient to settle the question, where we have an opportunity of carefully watching a case from the commencement. But unless other differences could be pointed out, it might be fairly questioned whether the two diseases were essentially distinct. In remittent, then, let us recollect, that the matter vomited is usually bilious throughout, whilst in yellow fever it is first clear, then yellowish, and finally blackish, or completely black. It is said also that in the latter the stomach is emptied without effort, and the desire to vomit ceases for the time, whilst in remittent the act of vomiting is painful and diffi-

cult, and the nausea persists. In remittent, there is a tendency to fullness of the hypochondriac and epigastric regions, whilst in yellow fever, according to Louis, the abdomen uniformly preserves its natural form. I cannot help thinking that this difference in the conformation of the upper part of the abdomen, will be found to be an important distinctive feature; but to determine the question requires further observation, and I therefore throw it out as probable merely. The probability is to my mind much increased by considering that in remittent the spleen and liver are, generally at least, enlarged, and often to a great degree, especially the former, whilst in yellow fever they preserve their natural size, or nearly so, and hence we should naturally expect a corresponding difference in the conformation, at least of the hypochondria. In remittent, also, the hypochondriæ, especially the left, are sometimes painful, a condition, so far as we are aware, not noticed in yellow fever. The character of the yellowness is said to be different in the two diseases; and Dr. Stevens affirms that in yellow fever the patients do not shake nor tremble like those who are under the influence of marsh poison, and that the expression of countenance is so peculiar, that those who have once seen it, easily recognize it. R. Jackson, also, in his account of the fevers of Jamaica, says that the horror and shivering which so usually precede fevers, were seldom great in degree in the disease before us. Cramps, too, are said to be much more frequent in this than in remitting fever. Such appear to be the principal points of difference, so far as regards the symptoms; and if we consider them in connection with other differences presently to be mentioned in reference to the origin, prevalence, &c., of the two diseases, the very opposite condition of the liver and spleen, as discovered by post-mortem examinations, and the presence of a brown or black matter in the stomach and intestines in the one case, which is not met with in the other, it seems to me that it is scarcely possible to avoid the conclusion that the two diseases are essentially distinct. The enlargement and softening of the spleen in bilious remittent, and other types of fever of malarious origin, is a prominent fact attested by most writers; and this fact alone is almost sufficient to convince us that yellow fever, in which the spleen rarely presents any considerable traces of disease, must be essentially distinct in its nature. The very opposite conditions of the liver are also especially worthy of notice; that in yellow fever being anemic, with deficiency of bile in the gall-bladder,—that of remittent being usually enlarged, and with the gall-bladder fully distended."* Dr. Wurdemann observes, "If I were asked what was the most prominent pathognomonic symptom in yellow fever, one that most distinguished it from those cases of remittent bilious

* [Stewardson's edition of Elliotson's Practice of Medicine, p. 356.]

fever complicated with gastritis, so prevalent during epidemics of the former, I would answer, the total cessation, or the much diminished and vitiated secretion of bile. For although it is sometimes ushered in by bilious vomiting, the bile thus ejected has been mechanically forced from the gall-bladder, where it had been collected previous to the attack. It is very certain that the restoration of the functions of the liver is the most favourable symptom in the course of the disease. The physiognomy of yellow fever differs also from that of the most aggravated cases of remittent bilious fever. In the former, there is a peculiar glassy appearance of the eyes, even when they are but slightly red; an anxious expression of the countenance, that the real or assumed calmness of the patient cannot entirely control; and a constant, but more or less strongly marked torpor of the cutaneous circulation, evinced by the slow return of blood pressed by the finger from the injected capillaries, as if these vessels were in a state of passive hyperemia."*]

It may be distinguished from plague by its existence in a temperature which puts a stop to the progress of this disease by the non-appearance of buboes or carbuncular eruptions, and by its being always ushered in by a violent febrile paroxysm, which is not usually the case in plague.

From typhus it may be known by its not occurring in cold weather; by its attacking the young and robust; by the yellowness of the skin; pain of eyeballs, &c.; and by its occasional termination in intermittent and remittent diseases.

VI. NATURE.

Very different opinions are entertained respecting the nature of yellow fever. Some, with Tomasini, Pringle, Lind, Mosely, Pinel, Rubini, and others, maintain that it is a general pyrexia, complicated with inflammation of the liver and internal surface of the stomach and intestines. Bailly and Bancroft associate it with typhus fever, and ascribe the fatal cases to lesions of the brain and stomach. Others regard it as a variety of remittent fever. [Nearly all the late writers on yellow fever agree in regarding it as a continued fever, (see p. 32.) "It may be fairly doubted," Dr. Stewardson observes, "whether it is ever characterized by regular and distinct remissions. Towards the third or fourth day, especially in the inflammatory form, there appears to be sometimes a rapid abatement of the more violent symptoms; the pulse falls, and the skin becomes cool. This abatement, however, is but the precursor of a favourable, but more commonly of a fatal termination, and not to be confounded with a true remis-

* [Am. Journ. Med. Sciences, Jan. 1845, p. 51.]

sion. It is also said, that shortly after the attack has commenced, in the course of the first twenty-four hours, the patient will express himself as feeling better, although the symptoms indicative of intense disorder, still persist. 'A trifling abatement of the symptoms,' says Dr. R. Jackson, 'was sometimes taken notice of, in ten or twelve hours after the commencement, but in no instance, so far as I have observed, was there ever so much alleviation, as with any justice could be called a remission.' It is not unlikely that these changes, especially where the mind of the observer was already prepossessed with the idea that yellow and remitting fever were essentially the same affection, may have led to the supposition that the former presented a truly remitting character. That it ever does so, appears at least to be very doubtful."* Dr. Imray, speaking of the two epidemics in the island of Dominica, remarks, "Yet could the term *remitting* in no way be applied to the fever, for even in the mildest cases the peculiar and distinctive symptoms of the epidemic were always present. * * * * It cannot be called periodic, for in every instance almost it marches on with a steady pace, either to a fatal issue or recovery. There are, in general, absence of rigors, a stage of excitement of greater or less intensity, the singular subsidence of the increased vascular action, the absence of pain, cool skin, cerebral and nervous symptoms, black vomit, and death."†]

With few exceptions, however, it is now viewed as a specific disease; and, as such, its proximate cause, or essential nature, has given rise to much discussion—some referring it to the lesions of the solids, others to disorganization of the fluids.

With some slight modifications, Broussais, Dubreuil, and Boisseau, regard the phenomena of the disease as the sequel of a primary inflammation, of the gastro-intestinal inflammation. Dr. Wilson, (*Memoirs of West Indian Fever*,) who says that there is a want of consent between the power of the disease and its external manifestations, maintains that it is owing to the presence of a peculiar morbid affection of the alimentary canal; others attribute it to disorder primarily taking place in portions of the nervous system—the brain and spinal column, according to M. Francois and Boyle. Dr. Gillkrest says, that the uniform integrity of the cerebral functions in the first stages of this malady, as observed at Gibraltar in 1828, and as noticed on other occasions, the extremely frequent integrity of these functions to almost the last moments of existence in its congestive or more intense and fearful form, together with the remarkable manner in which the secretions are often suspended, induce him to think that the ganglionic system is involved very prominently in the series of

* [Stewardson's edition of Elliotson's Practice, p. 357.]
† [Ed. Med. and Surg. Journ., October, 1845, p. 321.]

morbid actions. Dr. Craigie attributes the phenomena to a general affection of the capillary vessels, which is an application to this disease of the views he entertains of fevers generally. The chief advocates of the theory, that yellow fever originates in disorder of the fluids, are Guyon, De Fermon, and Dr. Stevens. The latter states that the disease is caused by an animal poison which remains dormant in the system about four days, during which it effects certain changes in the blood, which unfit that fluid for nourishing the system. Not only does it become darker in colour but altered in composition, as is evident from its having, when first drawn, a peculiar smell, and its almost invariably coagulating without a crust; from the appearance of black spots on the surface of the crassamentum, by the coagulum being soft and easily separated, and by a large quantity of black colouring matter falling, during its formation, to the bottom. Moreover, when the serum separates, it has generally a yellow, in some cases a deep orange colour. He says that these derangements are often so apparent, that in some instances, where the individuals have been accidentally bled, he has been able to foretell an attack of fever, merely from the appearance of the blood which had been drawn previous to the commencement of the cold stage. The intermixture of the poison with the blood (Dr. Stevens supposes) causes a deficiency in its saline constituents; the results of which are, that in the early stage of the disease the structure of the red globules becomes deranged, so that they do not separate freely and entirely from the serum, but are partially dissolved in it, while in the advanced state they become entirely black, and the whole mass of the blood thin and poor. This state is evinced during life by the oozing of black fluid blood from the tongue, eyes, skin, or other surfaces, and by the condition of the blood in the dead body. With regard to the change of colour in the blood, Dr. Stevens states, that in the commencement of the fever, it is dark from the effect of the poison, and that in the last stage it appears to be black merely from the loss of its saline matter:* for when we add any of the natural saline ingredients to the black fluid which is taken from the body late in the disease, it becomes florid, and more healthy in appearance than when the saline matter is added to the poisoned blood drawn

* As these statements involve the accuracy of many of the received views and opinions on the arterialization of the blood, Dr. Turner made a series of experiments, from which he says, that he is at a loss to draw any other inference than the following:—That the florid colour of the blood is not due to oxygen, but, as Dr. Stevens assumes, to the saline particles of the serum. The change from venous to arterial blood appears, contrary to the received doctrine, to consist of two parts, essentially distinct; one is a chemical change essential to life, accompanied by the absorption of oxygen and evolution of carbonic acid; and the other depends on the saline matter of the blood, which gives a florid tint to the colouring matter, after it has been modified by the action of oxygen.

from the system before the attack. He, therefore, thinks it probable that the greater part of the poison is either changed in its properties during the disease, or thrown out of the system in its original form by the secreting organs. This morbid condition of the blood he concludes to be the first link in the chain of those phenomena which constitute fever; for, as this pernicious blood circulates, it acts on every fibre and on every tissue of the living system, disturbs every function of the body, and deranges every faculty of the mind, while all the excretions have a morbid appearance, and the secreted fluids are changed both in quality and quantity.

[Two recent writers on the pathology of yellow fever express the opinion, that the disease is due to the introduction into the blood of a poison from without, which propagates itself by zymotic action, causing profound alteration of that fluid. "Who," says Dr. Nott, "can hesitate to regard yellow fever as a well-marked case of poisoning? Sometimes a patient coming into the infected district, in perfect health, is stricken down by this poison with the rapidity of lightning; the powers of life are annihilated at once, and in 24 hours he dies without recovery from the first blow. I have seen several the last winter whose first symptoms were coma, convulsions, or both. How different from local inflammations."* "*Post-mortem* examinations," remarks Dr. Imray, "have done but little in unfolding the real nature of yellow fever. Indeed, the more the disease is studied, the deeper becomes the impression that the poison acts chiefly on the vital fluids. It would seem in many cases as if the blood were that part of the system from which the vital principle began first to be withdrawn. It need not be repeated that the morbid changes observed in the stomach and brain, at least such as are appreciable to our senses, can scarcely be considered as accounting satisfactorily for the symptoms and rapid course of the fever. The gastric and cerebral symptoms are probably only consequences or concomitants, for sometimes there is little or no irritability of stomach, though the black vomit is almost always found in that organ. Many cases, likewise, terminate fatally without the presence of such disorder of the cerebral functions as can in any way account for death."†]

VII. CAUSES.

The opinions which are entertained respecting the causes of yellow fever may be arranged under three heads:—1. That it is a disease essentially of endemic origin; 2. That, being of endemic origin originally, it becomes contagious; 3. That it is solely and

* [Am. Journ. Med. Sciences, April, 1845.]
† [Ed. Med. and Surg. Journ., Oct., 1845.]

essentially induced by contagion. Those who entertain the first view are by no means unanimous as to the nature of the endemic cause to which they attribute the origin of this fever. Almost every possible physical condition has in its turn been thought to be the true one. Marsh miasm has been very generally regarded as the origin of yellow fever. Dr. Bancroft, who is one of the most able writers on the subject, says, that those whose minds are unbiased will clearly recognize in this disease all the peculiar features and characteristic marks by which marsh fevers are distinguished in all parts of the world; and they will naturally conclude that, though it be the most aggravated and violent of the fevers arising from miasmata, this aggravation and violence are produced only by a greater concentration or virulence in the latter, joined to a greater intensity of atmospherical heat, acting on persons but little accustomed to bear it, whilst they retain the excitability of cold or temperate climates, together with an habitual disposition to generate that portion of animal heat which such climates require. In this opinion he coincides with Dr. Rush, who says, that we might as well distinguish the rain which falls in gentle showers in Great Britain, from that which is poured in torrents from the clouds in the West Indies, by different names and qualities, as impose specific names and characters upon the different states of bilious or marsh fevers. Without entering again into the question of the identity of these diseases, there can be no doubt that yellow fever, in common with fevers whose origin is undoubtedly due to marsh miasmata, often assumes a peculiar virulence of character in situations which are favourable to these latter; and that it is in such situations in hot climates where malaria are prevalent, as at the estuaries of rivers and the shelving shores of the sea, that yellow fever is most usually met with; and that it occurs both sporadically and epidemically in the same seasons, in which experience has taught us malaria give rise to intermittent fevers. Opposed, however, to the view, that yellow fever is owing to marsh exhalations, are the facts that it very frequently prevails where no cause of this kind can be traced to be in operation; and that marshes often abound in hot latitudes without the disease occurring in the neighbourhood. Numerous instances have been brought forward to show that it prevails where there is no marsh exhalation. Its occurrence on shipboard without there being the least possibility of tracing the presence of marsh vapours to the ships themselves, or to the places near to which the vessels are moored, has been particularly dwelt on. Bancroft endeavoured to show, that in these cases it was owing to decomposition taking place in the ballast, or to the putrid state of the bilge-water. Subsequently to these views having been expressed, the possibility of the first has been obviated by the adoption of iron ballast, and of the

second by the frequent changing of the water, yet the fever has equally prevailed. At Barbadoes the physical characters of the island are such as to preclude entirely the idea of the existence of marsh exhalation; besides which, from its having been for a long period in a state of the highest and most complete cultivation, it is trenched, drained, and cleansed, and has undergone all those improvements which render a territory, as far as possible, free from marsh exhalation. Corresponding with these peculiarities of its physical structure is the fact, that none of the modifications of ague are endemic in Barbadoes. Yet yellow fever has been at all times, and still continues to afflict the population of this island in the severest forms of the disease.

With regard to the second point, that it does not occur in situations where marshes abound, Dr. Wilson (*Edin. Med. and Surg. Journ.*, vol. xxxv.) quotes the very strong case of its not being a disease of Rio Janeiro, and contrasts it with its prevalence at Vera Cruz—both under nearly equal parallels of latitude; both built on a low sea-shore ground, skirted by high mountains, though at unequal distances; the religion of the inhabitants the same, and their habits and modes of life very similar. Yet, while Vera Cruz, without a rood of marshy soil, is a hot-bed of West Indian fever in its most violent forms, in Rio Janeiro, though situated near an extensive swamp, and liable to ague, yellow fever is never known. In Honduras, also, which is situated close to the sea, and occupies part of a large bog, and is during the rainy season so perfect a lake that teal and snipe may be shot from the windows, while in dry weather it becomes so parched that the inhabitants have difficulty in procuring water, though the inhabitants suffer much from intermittent and remittent fevers, the yellow fever is comparatively unknown. The same immunity is enjoyed by Demerara, which settlement is a narrow tract, low, level, extending along the sea-coast, and intersected with canals and ditches, alternately inundated and covered with stagnating oozy water abounding with vegetable matter. Here the soil is a swamp, and the ditches are marshes; nevertheless, the yellow fever is an exceedingly rare disease.

[The common origin of yellow fever and intermittent and remittent fevers, has been largely examined and ably discussed by Dr. Imray in the communication so often referred to. It has been asserted by Chervin and others that yellow fever belongs to the family of intermittent and remittent fevers, of which it is merely the highest degree, and that they are all produced by the same cause in different degrees of concentration. To the making out of this position, Dr. Imray observes, "there are many insurmountable difficulties. If it be assumed that the epidemic febrile disorder usually recognized as yellow fever, is identical in cause with the endemic periodic fevers of these islands, it is natural to

conclude that where those diseases most prevail, yellow fever ought most to show itself and occur in its most malignant and virulent forms. How stand the facts? Compare the islands of Dominica and St. Lucia with Barbadoes. The two former composed of masses of lofty mountains, intersected by deep ravines and valleys, and covered in every direction with forest and brushwood, are only under partial cultivation, and abound in miasmata. There are situations in both these islands so inimical to the European constitution that a residence even for a short time, is almost with certainty followed by an attack of intermittent or remittent fever. Periodic fevers are of constant occurrence in these islands at all seasons, though prevailing more at one season than another. Barbadoes, on the other hand, presents comparatively a level surface, almost entirely under beautiful cultivation. Here are no lofty mountains, dense forests, or extensive morasses, and the consequence is, as might be expected, that periodic fevers are of rare occurrence. Indeed the island is so free from these disorders, that persons labouring under intractable intermittents repair thither for recovery. But is it equally free from yellow fever? The troops have repeatedly and severely suffered from epidemic outbreaks of this malady, and the mortality among the civilian inhabitants has at times been very great. And this appears to have been the case as far back as 1752, from the work of Hillary on the Diseases of Barbadoes; but at that time, it enjoyed no exemption from yellow fever. * * * * * Many examples might be adduced to show that yellow fever may prevail with great malignity, where the intermitting types are scarcely known. The troops suffered much for some years from yellow fever at St. Christopher's. Burntstone Hill, on which the garrison is placed, rises 700 feet above the level of the sea, and is not surrounded by any morasses or thick wooded land. There are no pools, lakes, or marshes, and the rain pours at once into the sea, through deep ravines and clefts. Yet to this dry, rocky hill, where intermitting fevers are but rarely met with, did the yellow fever cling so pertinaciously, and produce a mortality so great, as to occasion the withdrawal of the troops entirely from the island."

These observations are fully sustained by those of Catel and Rufz, of Martinique.]

Its origin has by others been attributed to intense solar heat, acting either *per se*, or on wet and marshy coasts. Sir Gilbert Blane, as previously mentioned, states that yellow fever never occurs either in tropical or temperate latitudes, unless the temperature has for some time been steadily at or above 80°. It is a matter of general observation, that an elevated temperature almost invariably accompanies the development of this disease; and that near those low situations in which it occurs, places which are on a higher level, and the temperature of which is consequently

colder, are not subject to it. Drs. Ferguson and Lind appear both, with certain modifications, to entertain this view of its origin. The former states this disease to be owing to a desiccation by heat, provided its operation be not disturbed by wind, &c.; the latter, when defining what unhealthy climates are, says, that in such places, during excessive heats and great calms, it is not altogether uncommon, especially for such Europeans as are of a gross habit of body, to be seized at once with the most alarming and fatal symptoms of what is called the yellow fever, without having any previous complaint, sickness, or other premonitory symptoms of the disease. Opposed to this theory, on the other hand, the names of many places may be adduced, in which, though having a temperature, according to his view, adequate to produce the disease, it does not occur. This, to say the least of it, invalidates the opinion that it is solely owing to an elevated temperature; and accordingly we find Dr. Wilson dismissing it very summarily, stating that the circumstance of yellow fever never having been seen in situations, as Kingstown in Canada, Moscow, and various places in Russia, in which the atmospheric temperature is equally high during summer as in places noted for the prevalence of that disease, affords a satisfactory proof that the cause assumed is insufficient to produce the effect. Dr. Craigie, who quotes many instances of the same nature, says, they are quite sufficient to prove, that the highest degrees of atmospherical or terrestrial temperature are not necessarily enjoined with the production of yellow fever; and that, though this disease requires a temperature of 74° or 75° for its production, its continuance is quite independent of this temperature; and that it irresistibly results, that high temperature, or intense and continued atmospherical heat, is not the most essential generating cause of yellow fever, but that the concurrence of some other circumstances is required. It appears, in short, that elevated temperature is merely one of many co-existing circumstances which concur at the period of yellow fever epidemics.

[" We know," says Dr. Imray, " that yellow fever is met with only in certain parts of the world, and certain localities; that a certain degree of heat, though not the cause, is absolutely necessary to give activity to the poison. But why in the same place and under circumstances apparently similar, it should at one time rage with frightful mortality, and at another the inhabitants be remarkably healthy; why it should be absent from a country for many years, and then break out without the possibility of assigning a satisfactory cause, are among the many difficulties connected with yellow fever that remain to be cleared up. There must be some new cause in operation, when these terrible epidemics burst out when least expected, or some unusual change in the common morbid agencies. It could not be said that the causes of the epidemic

still continued to exist in this island (Dominica), and only ceased to act because there was no material on which the poison could exert its baneful influence; for the European troops were more than once changed, yet not a single instance of yellow fever occurred either in the garrison, among the civilian inhabitants, or the shipping from 1838 to June, 1840. Moreover, were this the case, Europeans would invariably be attacked as they arrived in the West Indies. Now, we find that in some colonies, year after year passes on, and no case of the disease is met with, while the influx of Europeans is still going on. But so soon as the causes become developed, then do the natives of cold climates suffer; and if others arrive while the epidemic influence is in operation, the risk of attack is very great. At the same time it is perfectly true, that yellow fever occasionally disappears in consequence of the absence of predisposed individuals, while the causes linger in the country, and only manifest themselves on the arrival of Europeans, or of others who have become highly susceptible."

Hillary says, "It does not appear from the most accurate observations of the variations of the weather, or any difference of the seasons which I have been able to make for several years past, that the fever is in any way caused or much influenced by them; for I have seen it at all seasons of the year, in the coolest as well as the hottest time of the year, except that I have always observed that the symptoms of this (as well as most other fevers), are generally more acute, and the fever usually higher in a very hot season, especially if it was preceded by warm moist weather, than it usually is when more cool."* Dr. Rufz observes, "Now, whether the thermometer was high or low, whether it rained or was fine weather, hot or cool, yellow fever always prevailed with the same intensity, without the character of the season appearing in any way to influence its progress." Dr. Craigie remarks, "It appears that yellow fever becomes epidemic neither in consequence of intense temperature alone, nor humidity alone, nor filth, nor the presence of foul docks and wharves, nor desiccated marshes, nor decomposed cabbages or coffee, or mangroves, nor even charred shipholds; but a certain condition of the atmosphere, which occurs at very uncertain intervals, and of the recurrence of which the circumstances now enumerated are indications."†]

Others again, and of these the chief is Dr. Miller of New York, state that yellow fever is generated by the impure air or vapour which issues from the new made earth or ground raised on the muddy and filthy bottoms of rivers, and which deteriorates the air above it. Consequently this fever is found to rage chiefly where large quantities of new ground have been made by banking out the rivers for the purpose of constructing wharves; and

* [Diseases of Barbadoes, &c.]

† [Craigie's Elements and Practice of Physic, v. i., p. 236.]

that its great prevalence in New York and Philadelphia is owing to the shores of their several rivers having undergone great and rapid alteration for this purpose. It is obvious, however, that this is not a constant condition of the origin of yellow fever; and though many of the places which are peculiarly subject to this disease have a sea-coast which is loaded with alluvial mud, yet in many others where it occurs there is nothing presented but a firm rocky shore. The same objection may be made to many other statements of its origin, as the principle of vegetation, the elementary decomposition of vegetable substances, damaged coffee, &c. Dr. Wilson (in his *Memoir*, published in 1827), endeavoured to show that this disease is caused by the gaseous product neither of vegetable nor herbaceous matter, but of trees, shrubs, or of any sort of wood in a state of decomposition. This view he has very ingeniously applied both to its occurrence at sea and on shore. Dr. Wilson, to say the least of it, has placed his different facts and arguments in an order so clear and forcible, that his theory assumes on the whole an imposing and persuasive aspect. Its occurrence in the Caribbean Islands and other places, where there is apparently a difficulty on these grounds of accounting for it, he attributes to a specific decomposition taking place amidst the vast coral reefs, which, from their texture being porous, loose, and traversed with crevices, form at all times a never-failing receptacle for every species of decayed wood, leaves, &c. In other places he thinks the mangoe tree in a state of decay is the immediate source of the peculiar exhalation.

The origin and progress of yellow fever on shipboard have ever been a perplexing point. In accordance with his theory, Dr. Wilson accounts for it by supposing, that the wood forming the interior of the holds of ships undergoes, in tropical climates, a great change, during which some of its constituent principles suffer decomposition, and pass off in a gaseous form. This change is manifested by the wood becoming dark; by its shrinking and becoming denser in structure, and at the same time losing weight; in short by seeming to be partly charred. The extent to which this process is carried, and the nature of its results, are modified by the previous condition of the wood, by the degree of heat, and probably by the interior arrangements of individual ships. In a vessel newly built, arriving in the West Indies in the hottest season of the year, remaining for weeks in harbour, with the hold cleared and heated by stoves, the process is speedily completed. According to Dr. Wilson, fever in such circumstances appears early and spreads rapidly; but when once it ceases, it does not again return. In a vessel, on the contrary, which arrives in the cool season, is much at sea, and its hold not dried by stoves, the process of decomposition is slow and imperfect, and may never be completed. In such a vessel, fever will never be severe and

very fatal, but it will often recur and produce sickliness and death till the last day of its continuance on the station.

Amiel says that it appears evident to him that the occurrence of the yellow fever epidemics is the result of atmospherical vitiation, from the fact of the disease having been constantly influenced by atmospheric circumstances. They have a fixed period for their appearance, a fixed period in which they attain their maximum mortality, and a fixed period for their termination. Dr. Craigie says, the only mode in which he conceives all these discordant statements can be reconciled, is by supposing yellow fever to be a disease proceeding not from the influence of terrestrial miasmata, or mere local peculiarities alone, but from atmospheric peculiarities entirely; which, however, operate much more directly and forcibly in situations favourable to the production of terrestrial emanations. While ague is the offspring of the marsh and its margins, and remittent is the effect of a more concentrated form of the same exhalation from any moist surface in the process of solar desiccation, yellow fever appears to be the exclusive product of that state of the atmosphere which takes place after a long continuance of solar heat with little or no wind, in those points chiefly where the atmosphere of the sea and that of the land are in constant communication and interchange.

Those who entertain the view, that yellow fever is a contagious disease, are divided in their opinions, the one party holding that it is at all times essentially and absolutely the result of contagion; that it differs entirely from endemic fever; never proceeds from it, and never passes into it. The other party entertain the view, that the same causes which produce endemic fever may, by the superaddition of a contagious property generated in the subjects of the disease, give rise to another form propagated only by contagion. Dr. Stevens, who advocates the former view, says, that in the African typhus, as well as in that new disease, the dandy fever, we must either shut our eyes against the most positive evidence, or admit that contagion is the sole cause of both these fevers; the proofs of this which he has witnessed are, to his mind, just as strong as those in favour of the contagious character of either small-pox, scarlatina, or any other disease acknowledged to be contagious. A host of evidence may, however, be produced against these views; but as the facts and arguments are much the same as those which have been detailed as bearing upon the question of contagion in Plague, it is unnecessary to enter fully upon the subject here. We must not, however, pass over some of the observations which have been made by Dr. Chervin, who has, for years, most industriously and strenuously opposed the doctrine of contagion as applied to yellow fever in particular. After showing that the statements which are made of the importation of yellow fever into Barbadoes by the ship

Hankey, which are particularly dwelt upon by Chisholm as evidence of contagion, are anything but correct or conclusive; and after having generally exposed the weakness and insufficiency of the facts and arguments of the contagionists, he adduces the following reasons for the conclusion, that yellow fever is not contagious:—1. Although it has been the constant practice of the inhabitants of towns in the United States to flee to the country as soon as the disease appears, and for those who are attacked to be conveyed to the abodes of their families, yet in no instance has the yellow fever been propagated out of the towns, or in the interior of the country thus communicated with. 2. That in hospitals devoted to yellow fever patients, the attendants of every class have been invariably exempt from the disease, when these establishments are situated beyond the source of the sickness, and if the attendants did not expose themselves to it. 3. That though, according to the hypothesis of contagion, it might be imagined that persons frequently approaching patients within the range of infection are more liable to contract the disease than those at a distance, and not communicating with them, yet this is not the case. 4. That in fact the nearest communication with the bodies of the diseased, the inoculating with the blood of persons so affected, the drinking the black vomit, &c., have not propagated the disease. 5. That the apparel used by patients has appeared to be equally inoffensive as their persons and corpses; and that separation and seclusion of the healthy from the sick, and the prohibition of all intercourse, direct or indirect, have entirely failed in preventing its occurrence.

In order to prove the agency of contagion, a condition is absolutely necessary, which hitherto has never been properly attended to, viz., that the persons to whom the disease has been supposed to be communicable, should not reside in the same situation or locality as those by whom it is believed to be communicated, as in such case their being subject to the same influences as those already diseased, entirely invalidates any argument that may be offered in support of the operation of contagion.

[As a proof that yellow fever is not disseminated by a contagious principle, Dr. Imray relates the following circumstance:—"On the 13th December, 1844, the detachment of the 46th regiment in garrison [at Dominica] was replaced by a company of the 71st from Grenada, that island, at the time of their departure, being healthy. On the 27th December another company of the 71st was disembarked from the mail steamer, and marched to Morne Bruce,—the passage by steam from Grenada being about thirty hours. Shortly after the first company left Grenada, yellow fever broke out in the garrison there, and was prevailing at the time the second company left. Two men were taken away ill, who, on landing, were carried to the garrison hospital. [Both

died with black vomit.] After several days had elapsed new cases were admitted to the hospital, and the disease continued to prevail with great mortality, being, however, confined, with two exceptions, to the company by whom it was imported. During this time there was no interruption to the usual intercourse between the town and garrison. The non-contagious nature of the fever was rendered still more certain by the removal of the troops from Morne Bruce to a level spot of ground in the environs, and no precaution was taken to prevent constant communication with the inhabitants."* These circumstances show that malignant yellow fever may be introduced into a country, and not extend beyond the parties coming from the affected localities. Yellow fever had been prevailing for some time at New Orleans, when it appeared at Galveston, and there is much intercourse between the places. On the other hand, what Dr. SMITH considers the local causes of the disease were very abundant about the limited district—the strand—to which the infection was confined. There were animal and vegetable matters abounding around the houses, and a marsh exposed to the heat of the sun, when the temperature ranged daily in the shade from 84° to 89°. Patients were removed from the infected district to the healthy sections of the city without communicating the disease to their attendants, or the inmates in their new abode; these sections retained throughout the epidemic their healthfulness. Of the medical men of the place two only were attacked, and they alone dwelt in the infected district. Dr. SMITH performed many dissections, examining everything closely, and immersing his hands freely in black vomit, &c., with perfect impunity. He tasted black vomit repeatedly, when fresh ejected from the stomach of the living, with equal impunity. He says:—"After a careful observation of the history of the epidemic, no fact has come to light to show that the disease was contagious, that is, communicable from a person labouring under it to one in health, but that it is contracted only by exposure in the infected districts."†

Dr. NOTT says, that in Mobile no one, in or out of the profession, believes in its transmissibility, and that the town is peculiarly well situated for investigating this point.

To the question, "If yellow fever ever prevails sporadically," Dr. LOUIS, after a careful analysis of forty-five cases—nineteen of which were fatal, and 26 of which recovered, and which occurred at various periods when no epidemic was prevailing—answers the question in the affirmative, so far as Gibraltar is concerned. This point being settled, its non-contagiousness would not follow, as we every day see the most incontestably contagious diseases, as

* [Ed. Med. and Surg. Journ., Oct., 1845, pp. 338, 339.]
† [SMITH, loc. cit., p. 33.]

small-pox, under sporadic forms, and appearing only at distant intervals of time.]

In the absence of such satisfactory evidence in its favour, we think that, amid all the conflicting histories of the etiology of this disease, we are justified in stating the following to be fair conclusions in respect to its origin.—1. That yellow fever is not contagious, either primarily or contingently; 2. That it is essentially and solely of endemic origin; 3. That it is difficult to state decidedly what are the local causes which produce it: but most probably they are atmospherical: and as the disease is found only to occur on or near to the sea-shore, that most probably a climate which is modified by the sea forms a necessary condition.

The only satisfactory way of ascertaining what local and essential conditions are necessary to produce yellow fever, would be to investigate in such places where it is usually endemic, as at Vera Cruz, the west coast of Africa, &c., what those peculiar states are, both in respect to climate, physiognomy, &c., which do not obtain in other places in the immediate neighbourhood, and where the disease does not occur. This, however, cannot be expected to be accomplished, until medical topography has been more carefully and extensively attended to than has hitherto been the case.

Though the *predisposing* causes of yellow fever are very numerous, a few words only are necessary. That which requires most particular mention is, the powerful influence exercised by the coming of a stranger uninitiated to the climate where it occurs endemically. Beside this may be enumerated the ordinary causes which in other places predispose to fever generally, such as intemperance, excessive venery, prolonged study, manual labour under circumstances of great fatigue, especially if carried on in the heat of the sun, checked perspiration, sleeping exposed to the night dews. From what has just been said upon the causes of this fever, it may be well understood that we should not be inclined to estimate amongst its preventives the system of separation entailed by the quarantine laws with their train of hardships and inconveniences. The means of prevention consist rather in retiring, on the occurrence of yellow fever in an epidemic form, to the neighbouring high lands, or to some distance inland; in ventilating the houses, and in avoiding the predisposing causes of fever generally. Mr. Wallace says, that one essential point is to preserve, as far as we can, the natural energy of the system; which is best done by giving to the body regular sleep, adequate exercise, a moderately nourishing diet, and to the mind a proper degree of recreation and employment. As much as possible, means should also be taken to protect the system from the morbid influence of the atmosphere, by being within doors by nightfall, by keeping the windows closed during the

night, and by having fires in the rooms so as to prevent a stagnation of air. Experience has shown, that very little reliance is to be placed upon the disinfecting mixtures that have been proposed with the view of altering the constitution of the atmosphere, and by this means destroying the malaria which may exist in it.

VIII. TREATMENT.

From a review of the symptoms, the indications of treatment are, 1st. To subdue the inflammatory and irritative state of the system; and if possible, to prevent the supervention of local congestion or inflammation. 2. To prevent the system sinking into a state of collapse. 3. When the inflammatory state is subdued, to sustain the powers of the system. The modes that have been suggested to carry out these may be resolved into, 1. The *antiphlogistic*, which is by bleeding, both general and local, purging, &c. 2. The *mercurial*, (which, in some measure, is a branch of the first,) in which the chief reliance is to be placed upon ptyalism induced by the free administration of mercury. 3. The *stimulating*, in which bark, port wine, &c., are freely employed. 4. A plan of treatment in which all these modes are conjoined, ptyalism in addition to the antiphlogistic being first resorted to, and followed by the stimulating. This mixed treatment is founded upon the view, that yellow fever is primarily an inflammatory disease, becoming putrid in its progress.

1. Dr. Rush, who particularly condemns the two latter modes of treatment, is one of the most strenuous advocates for the antiphlogistic, recommending that it should be pursued to a very vigorous extent. When speaking of blood-letting, he says, that though in some cases moderate bleedings may be sufficient, yet, that generally it is required to be done very often, and to the abstraction of large quantities. Moseley says, that the intention of bleeding can be answered only by performing it immediately, and in the most extensive manner, which the high state of inflammation and the rapid progress of the disease demand: taking away only six or eight ounces of blood, because the patient may be faint, which is a symptom of the disease, is doing nothing towards a cure. Bleeding must be immediately performed and repeated every six or eight hours, or whenever the exacerbations come on, while the heat, fullness of pulse, and pains continue; and if these symptoms be violent and obstinate, and do not abate during the first thirty-six or forty-eight hours of the fever, bleeding must be executed *usque ad animi deliquium*. Bancroft thinks, that in order to avoid the mischiefs arising from the superadded violence of the disease, no means are so certain or bene-

ficial as bleeding; but that it may prove advantageous, it ought to be performed copiously, and from a large orifice, as early as possible after the inflammatory action is developed. Jackson also adds his testimony, that the abstraction of blood in large quantities is a most decisive process. Dr. Hector M'Lean says, that his experience confirmed its utility, and that his practice was much more successful after he had adopted blood-letting than before. He is not, however, an advocate for its employment after the first or second day; after the third, he decidedly condemns it. Sir W. Burnet became so convinced of the absolute necessity of the free abstraction of blood, that he issued orders to the surgeons of the fleet, when stationed in the Mediterranean, to the effect, that they should pursue this practice in every case of yellow fever that came under their inspection. He recommends it to be employed both generally and locally, in order to remove the affection of the brain; on accomplishing which, he says, depends all subsequent success, and which being removed, generally prevents the dangerous symptoms of the after stages. These operations, he adds, must be repeated according to the urgency of the symptoms; and though it will often happen, after a few ounces of blood have flowed, that syncope is induced, yet this must not prevent the repetition of the bleeding: in the course of an hour the blood-letting may generally be repeated, and thirty or forty ounces taken away without producing it. He further says, that blood has often been taken to the amount of 130 or 140 ounces, and even as far as 200, with the most marked advantage. On the other hand we find nearly all the practitioners in the West Indies, and many of the American and Spanish physicians, condemning the use of the lancet as strongly as those just mentioned have recommended it. But as their opinions merely amount to a denial of its efficacy, or to some strong statement, that those who may pursue such a practice are "guilty of nothing short of murder," or "are chargeable with their patient's death," we shall not particularly dwell upon them. It appears evident, however, from the experience of Chisholm, Townsend, Musgrave, Amiel, and others, that blood-letting carried to any very great extent, or after the first inflammatory stage of the fever has subsided, is decidedly injurious. Though it may be very beneficially pursued on the first commencing of the disease, its repetition in all cases is, to say the least of it, hazardous.

Mr. Wallace has placed the whole subject in a fair and judicious point of view, when he says that, as a general rule, blood-letting is inadmissible; but that to this rule there may be many exceptions. If the patient be decidedly labouring under inflammatory disease; if the arteries are beating strongly, with the skin parched and burning, the headache acute, and all or the chief of those symptoms which constitute synochal fever be present, there

cannot be a doubt as to the propriety of having immediate recourse to blood-letting. (*Edin. Med. Surg. Journ.*, vol. xlvi.) There is indeed no other remedy to which we can look, in such cases, for anything like immediate and decided advantage; and therefore it is indispensably necessary, not only to have recourse to it early, but to carry it to the requisite extent. It will not do to measure the quantity of blood, or to settle beforehand the number of ounces we may with propriety take away; but we are to look to the character of the disease and to the strength of the patient; and so long as the latter will bear further reduction, and the former is evidently continuing its course, so long will it be necessary for us to proceed with the remedy. But supposing the fever to have a somewhat different character; the pulse, though tolerably full, to be easily compressed; the heat of surface moderate; the headache accompanied with a slight degree of stupor, with that degree of anxiety which indicates as much of nervous as of vascular derangement, then, although blood-letting may still be admissible, nay, perhaps indispensable, it is necessary to weigh carefully these two very important questions:—1. Whether general blood-letting ought to be had recourse to at all? and, 2. To what extent it should be carried? And again, if the disease have still a different character; if the strength of the artery, instead of being increased, be diminished; the surface cold and slightly clammy; the patient nearly heedless of what is passing around him; and all the energies, mental and corporeal, depressed in an extraordinary degree, under such circumstances, if blood-letting be not altogether proscribed, it will at least be but seldom admissible: and, indeed, nature herself, by obstinately refusing to yield the blood, often at once points out the impropriety of the practice, and effectually prevents its being carried into effect. In addition to general bleeding, if there be any very prominent symptoms of local congestion or inflammation, topical bleeding may be resorted to. Depletion by leeches or cupping has been found materially to contribute towards relieving headache and checking the incipient gastric symptoms.

[Yellow fever assumes diverse types in various years, and in different latitudes. Dr. Nott witnessed five epidemics of yellow fever at Mobile,—1837, 1839, 1842, 1843, 1845,—each of which presented some predominant peculiarity of type, and all demanded some modification of treatment. This may account for the opposite opinions expressed with regard to the treatment of this disease, and more particularly of the advantages of blood-letting.

"The symptoms," observes Dr. Imray, "in appearance, may be much the same, yet, in different countries, situations and seasons, different remedial measures are required, and no one plan of treatment has yet been discovered that can be considered applicable in every instance. We have an example of this in the

two islands of Martinique and Dominica, both mountainous, similar in geographical formation, with the same temperature and climate, and separated by a channel scarcely thirty miles in breadth; yet we find the epidemic yellow fever in the one island successfully treated by blood-letting,* while in the other the same treatment was followed by opposite effects. * * * * * Though fairly tried by the civil practitioners, as well as the military medical officers, it was found, as a general plan of treatment, not to succeed. Assistant-surgeon Millingen found, that in very few cases was bleeding admissible. It only tended to bring on sooner that debility which supervened so early, and diminished the prospect of the patient's recovery."†

Dr. Nott lays it down as a general rule, that yellow fever is not a disease which demands active depletion; that cases demanding the use of the lancet are rare at Mobile. "When," he says, "the pulse is full and strong, and is decidedly *above par*, the lancet should be used promptly and boldly to guard against the production of local lesions, but we should at the same time bear in mind that this stage is of short duration; that we are dealing with a specific disease, which has a strong tendency to early collapse, and we soon may have need for all the strength that we take away."‡

Dr. Dickson observes, with his usual judgment:—"I repeat, then, that while I propose to you no speculative objections against the lancet, and admit that circumstances may call for its occasional employment, the results of experience and observation are unfavourable to the general or frequent resort to it. * * * From all this you will not fail to perceive, at least, the necessity of due caution and prudence in the use of the lancet. It is available only in the first stage of the disease, which rarely affords opportunity for its repetition. If you determine to resort to it, place your patient half erect, make a large orifice, and draw from the vein at once a sufficient amount to make a forcible impression on the system. You will thus fulfil your purpose of the reduction of vascular excitement with the least absolute diminution of the original powers of action and resistance of the constitution."§]

In addition to blood-letting thus judiciously employed, the exhibition of purgative medicines has been very generally approved. Nevertheless, there has been some contrariety of opinion expressed as to their selection. Rush and some others have administered them to a very great extent, in doses, for instance, of fifteen grains of jalap and ten of calomel, every two or three hours. Hillary,

* [Catel and Rufz both employed blood-letting largely, the former to syncope.]

† [Ed. Med. and Surg. Journal, October, 1845, p. 328]

‡ [Am. Journ. Med. Sciences, April, 1845, p. 293.]

§ [Dickson's Practice of Physic, vol. i., p. 360.]

Hume, and Cleney, who do not approve of this severe treatment, recommend the administering of much milder medicines, such as manna with cream of tartar, sulphate of potash, rhubarb, &c. [In an infusion of senna and rhubarb in which manna had been dissolved, Dr. Smith found a purgative which unloaded the alimentary canal without irritating the mucous membrane.] Dr. Bancroft, who states that it is particularly necessary to obviate the tendency to accumulation of the alimentary contents, as they are in great measure the source of the morbid irritability of the whole intestinal canal, and more especially of the stomach, recommends that such medicines should be employed as will not offend and irritate the stomach by their bulk or quality. There can be no doubt that, when this organ is not in a state of too great irritability, the administration of mild but efficient purgatives is of the most essential service; it is, in fact, a practice which should by no means be omitted. As there is very often, however, so much irritability of the stomach as to render it almost impossible for any of the purgatives in ordinary use to be retained, the previous administration of small doses of opium, or the combination of opium with the purgative, should be resorted to; and in case of their not succeeding, warm emollient and purgative clysters should be freely administered, until free evacuation of the bowels be procured, after which irritation of the stomach is generally allayed. Mr. Tegart has the merit of proposing the exhibition of the croton oil, not only in these cases of excessive irritability, but generally. He says, that a drop or two placed upon the tongue almost immediately excites the bowels to action, without adding to the irritability of the stomach. Mr. Hacket, who attributes much of the success of his practice at Trinidad to the use of this medicine, both by mouth and by clyster, says that the power which it has of allaying gastric irritability and general nervous excitement, as well as restoring the circulation to the surface, and thus relieving the internal congestion, is extraordinary; and though it may seem, for the moment, when first given, to increase the irritability, yet, after a little time, it hardly ever fails to produce the desired end.

The prompt administration of emetics has by many been strongly recommended, but more especially by Arejula, one of the first authorities in the treatment of yellow fever. They are condemned, however, by most practitioners, and we think with justice; for, as Bancroft observes, in place of allaying nausea they have rather a tendency to excite the irritability of the stomach, which we have just shown is an object particularly to be subdued and guarded against.

Cold affusion has been recommended. Some, indeed, state, that if employed on the first commencement of the disease, it very frequently succeeds in cutting it short entirely. Without, how-

ever, anticipating so happy a result, there can be no doubt that this remedy, judiciously applied, is most salutary. Its immediate effect appears to be that of lowering the temperature, soothing the general irritability, inducing sleep, and recruiting the powers. Should the disease, however, have passed into a stage of collapse, this remedy, unless carefully employed, may be attended by very unpleasant results. Under such circumstances, aspersion, or slight sponging, may be resorted to, administering, at the same time, nourishment and cordials. The general rule to be observed in the use of cold bathing is, that it be resorted to as long as the heat of the body is above the natural standard; and that when the temperature is depressed, it should be omitted. Under some circumstances the warm bath has been also recommended; and JACKSON has combined its employment with the use of the cold affusion. According to the experience of most practitioners, this treatment is followed by very questionable success.

In addition to the antiphlogistic means above detailed, the use of diaphoretics has been much recommended. Among these the acetate of ammonia, James' powder, Dover's powder, &c., have been particularly employed. Drinking small quantities of cold water has also been particularly advised: a liberal use of it has been found not only to determine to the skin, but to moderate the heat of the surface, as well as to allay the general febrile state. Dr. BANCROFT, though approving of this administration of cold water, and speaking of its effects, is yet opposed to the exhibition of the medicines that act upon the skin. He says, that though they have been frequently employed in the treatment of yellow fever, yet he cannot join in their commendation, because they tend to increase that disposition to vomit, from which the greatest danger is always to be apprehended; and that of this class none are so detrimental as the preparations of antimony, for they usually leave behind them an extreme degree of irritability in the primæ viæ, which too often resists all our endeavours to control it. In addition to the above means, the advocates of the antiphlogistic plan recommend the occasional use of epispastics and blisters: they have been recommended with the view of being useful as general and local revulsives, and it is on this principle that Dr. LINTON has suggested their application to the spine, which has been often found to allay, very singularly, the irritation of the stomach. Dr. GILLKREST suggests, in the hope of affording some palliation of the incessant vomiting, often so very distressing in yellow fever, the use of dry cupping on the epigastrium, as practised by ancient physicians in their endeavour to relieve the vomiting in malignant cholera.

2. The mercurial treatment has had its warm advocates as well as opposers. Chisholm, after thirty years employment of it, views it as a sheet anchor, but thinks that salivation is a ne-

cessary condition. This is likewise the opinion of Dr. Rush and many others. Many have also recommended in addition to the free internal administration of this remedy, that its effect should be accelerated by its external application. Bancroft, Dalmas, Stephens, and many others, do not, however, entirely approve of this practice. The former says, that previous doubts as to its efficacy have not been removed by subsequent experience; and that, at any rate, it appears certain, the good effects of the mercurial treatment have been greatly exaggerated; at the same time he cannot go quite so far as Dr. Grant, who avers that, although he has been called in to attend many under such circumstances, *not one* survived, and that they became victims to the mercury rather than to the fever. We think Dr. Bancroft's observations on the use of the mercurial frictions very just: he says that they do not seem likely to prove altogether innocent in those cases in which they may happen to do no good; for, besides the salivation which they may produce, when the patient lives long enough, and which is to be added to the number of his sufferings already sufficiently abundant, the very act of rubbing on the mercury tends greatly to disturb both body and mind when his only wish is to remain unmolested: while the covering a large portion of the skin with a greasy ointment, produces a considerable accumulation of heat therein, by which the general temperature of the body, and with it many of the other febrile symptoms, may be increased. There can, however, be no doubt, that the administration of mercury, except in the mildest cases, which will be found to give way to more gentle and simple means, is often attended by beneficial results; but at the same time the propriety of invariably pushing its exhibition to a state of salivation may be very much questioned; we are inclined to think, the chances of recovery, under such circumstances, would be rather diminished than otherwise, especially if collapse should intervene.

3. Though the mode of treatment by stimulating and tonic medicines has found some advocates, it has been so almost universally condemned, that Dr. Gillkrest is fully justified in saying, it seems quite impossible to explain how, up to the time of his death, large doses of *the bark* should have merited the special favour of Dr. Lafuente, one of the principal physicians connected with the epidemics of Andalusia, during some of the first years of the present century.

[It has been the practice, within a few years, in some of the southern and south-western states, to give very large doses of the sulphate of quinine from the commencement of the disease. A scruple to a drachm was often administered at a single dose. What success has attended this plan of treatment, the writer has been unable to ascertain with any degree of certainty. Dr. Imray states that "the sulphate of quinine was sometimes exhibited

when the stage of excitement had subsided, but it did not appear to exert any influence in preventing the usual train of symptoms which preceded death."]

4. After a careful review of all that is known on the nature of Yellow Fever, it appears that the treatment which comprehends the occasional application of the above plans, modified by the symptoms which arise during the progress of the disease, is not only the most philosophical, but has proved by experience to be the most successful.

Before concluding, we may mention that a variety of remedies, as opium, ether, lime-water, &c., have been applauded by some as exceedingly efficacious, and by others condemned as injurious in the extreme. The discussion of the relative merits of these, however, would occupy the time of the reader unprofitably; we forbear entering upon the subject: we must not, however, omit to mention the plan of treatment which has been specially recommended by Dr. Stevens. His theory of the nature of yellow fever has already been alluded to. Upon this he founds a system of treatment which consists in the free administration of saline medicines. He says, that when proper saline remedies (by which he means those which are not purgative) are used, they do not fret the stomach; they act on the intestines as much as is necessary; they keep up all the secretions, particularly that of the kidneys; and enough is absorbed to enter the circulation and prevent the dissolution of the blood, and preserve it until the fever abates and all the danger is past.

[The general plan of treatment adopted by Dr. Imray in the Dominica epidemic of 1843, is thus described by him. "The bowels were freely acted on by purgatives, warm baths were applied according to the symptoms, and saline medicines administered. When the surface was hot and dry, free perspiration was procured if possible. Local symptoms were treated by topical blood-letting, blisters, &c. The application of cold to the head, particularly by affusion, was as useful in controlling increased cerebral action, as pleasing to the feelings of the patient. Calomel was administered chiefly as a purgative, and was not given in large and repeated doses with the purpose of affecting the system, having formerly been found rather injurious than useful when exhibited with this view. Mr. Milligen used the chloride of soda in the military hospital with happy effects, where bleeding from the gums had taken place. It was administered in injections as well as by the mouth."

The treatment adopted by Dr. Ashbel Smith, in the Galveston epidemic, consisted of blood-letting employed, as soon as the excitement was fairly developed, till slight faintness was produced; hot and strong mustard baths were applied to the feet and legs; the patient was placed in bed, and sedulously guarded against

any current of cold air, which might repel the blood from the surface; and the cathartic administered until its operation was produced. After this no other medicine was required in the stage of excitement, but the hot mustard bath was repeated twice or thrice in the twenty-four hours, as a means of sustaining a continued glow on the surface, whilst a little tamarind water or sage tea was allowed as a beverage. If, after the abatement of the excitement, the extremities became cool, the hot mustard bath was promptly resorted to, and nausea and vomiting occurring, were allayed with black drop or laudanum. Opiates in the advanced stage were very useful, and appeared to save some who were rapidly sinking.

One point seems conceded by all,—that it is only at the commencement that treatment can be of much avail. Dr. IMRAY remarks that "the efficacy of early remedial measures was clearly shown in the military hospital, in the difference of mortality in those who came early to the hospital, and those who came later."]

CHAPTER VI.

INTERMITTENT FEVER.

[Syn.—Διαλείποντες πυρετοι, Hippocrates; *Anetus*, Good & Young; *Febris intermittens; Ague, Paludal Fever, Ague and Fever; Fièvre intermittente, F. d'accès, F. des marais, F. periodique*, Fr.; *Kalte fieber, Wechselfieber, Aussetzende fieber*, Germ.]

Intermittent Fever is so called from a very marked series of phenomena which take place during its progress. The chief characteristic is, that a paroxysm of fever is followed by a cessation of all febrile symptoms, which apyrexial period usually lasts during a well-defined period, and is very constant, though differing in duration in the various forms of this disease. The definitions which various authors have adopted are all founded on this peculiarity. Dr. Cullen describes intermittents as "fevers arising from marsh miasmata, consisting of many paroxysms, without fever, or at least with evident remission, returning with remarkable exacerbation, and in general with shivering, one paroxysm only taking place each day." This definition is far from being unobjectionable: that of Dr. Eberle is both more comprehensive and succinct, its generic character, according to this writer, consisting in "a succession of periodical paroxysms of fever, each paroxysm commencing with chills and terminating in free perspiration, with protracted intervals of perfect freedom from fever." (*Practice of Medicine*, p. 59.)

I. PREMONITORY STAGE.

Fever, in the various forms in which it ordinarily occurs, is almost always preceded by a condition known as the premonitory or forming stage; this includes the period intervening between the first deviation from health and the commencement of the febrile paroxysm. It has been stated by some observers, that this antecedent stage does not precede intermittent fever. Most writers, however, describe it; and there can be no doubt, though it may not always occur, that it yet happens sufficiently often to justify its being considered as a part of that derangement from healthy action, which is consequent upon the accession of this disease. The symptoms which characterize this stage are not uniformly very definite. They are illustrative of that state which may be

termed febricula. The patient feels tired, complains of slight headache and aching pains in the loins, and perhaps in his limbs generally, frequently with fits of yawning and stretching. The functions of the stomach are impaired, evinced by loss of appetite, flatulence, and constant thirst. The pulse is frequent, the skin is hot and dry, the urine high-coloured, depositing on cooling a red sediment, and the fecal discharges are dark-coloured and offensive. This state lasts in some cases for a day or two, in others extends to a period of ten days or a fortnight, there being usually a marked increase of the symptoms about midday. They eventually terminate in a rigor, which is the commencement of that series of phenomena which constitute the *paroxysm* of intermittent fever. This premonitory stage does not, however, appear in the intermittent type to follow the same laws in reference to the fever itself as is observed in the continued forms: in these latter the shorter the premonitory stage the more violent is the fever, while in intermittents the reverse is usually the case. This may probably depend on a difference in the nature and intensity of the remote febrific cause, or on the powers of reaction being very different in these several diseases.

When the premonitory stage has been superseded by the characteristic symptoms of intermittent fever, a new series of phenomena takes place: these are a paroxysm of fever alternating with a period of intermittence.

II. SYMPTOMS OF THE PAROXYSM.

The paroxysm of fever consists of three well-marked stages:—1. The cold; 2. The hot; 3. The sweating.

1. The *cold* stage is first ushered in by a sensation of some slight chilliness, with feelings of languor and long fits of yawning, which render the patient sensible of the febrile accession before it is suspected by others. The toes and last joints of the fingers lose their temperature and feel benumbed, and the nails have a bluish cast. This early period of the paroxysm is sometimes attended by pains in the back and loins, sometimes by headache and even stupor. The cold stage may now be said to have fairly set in: the patient is weary and restless, and complains of diffused aching pains; the ideas crowd rapidly on the mind, and the attention is with difficulty fixed; there is much oppression about the præcordia, with a squeamishness of stomach; the sensation of chilliness increases, and is experienced in defined lines, as if small streams of water were trickling down the back, shoulders, chest, and abdomen, until the coldness pervades the whole frame: these feelings at length become so real and intense that the patient buries himself beneath the bed-clothes,

and craves for warm drinks; the teeth chatter, the limbs shake, and in fact the whole frame participates in the general commotion, for the internal as well as the external organs are affected by the tremor. During the continuance of the rigor, as these symptoms are technically called, the patient complains of fatigue, the muscular strength being gradually exhausted, the sensibility of the surface diminished, the expression of the countenance pinched, the features shrunk and pale, the eye dull, sunk, and hollow, and the cheeks and lips livid and collapsed. The skin generally becomes pale and assumes a rough appearance, not unlike that condition which is termed "goose skin;" in many cases so contracted, that rings previously tight drop from the fingers, and tumours on the surface, if they exist, become shriveled. The pulse is small, contracted, and firm, generally quick, but sometimes slow and occasionally intermitting; the *tremor artuum*, however, interferes much with a just appreciation of the precise number of its pulsations. The respiration is hurried, anxious and oppressed, attended by a sense of weight, tightness, and incapability of taking a deep inspiration, frequent sighing, and not unfrequently by a short dry cough. The head aches; the mind is embarrassed, dejected and confused; and the patient is quite incapable of fixing the attention steadily on any given subject; occasionally there is delirium. Dr. Maculloch lays much stress upon the presence of a peculiar irritability of mind, to which the patient never becomes reconciled, however much he may to the other concomitants of the cold stage. He states it to be very constant, even in those chronic cases where scarcely any other symptoms are very conspicuous, and that it in fact constitutes at times the sole characteristic of the cold fit. (*On Marsh Fever*, p. 245.)

In those of a debilitated constitution, especially if there exist any tendency to plethora, a severe attack of the cold stage is frequently attended by drowsiness, if not by deep coma; the mouth and fauces are dry and clammy, but the tongue is moist; the thirst is urgent and continued; the urine is copious, clear, colourless, and does not deposit a sediment on cooling; the dejections are dark and bilious. Towards the conclusion of the attack nausea supervenes with occasional vomiting; this sometimes occurs to a severe extent. Sooner or later, however, the chills begin to abate, transient flushes of heat pass over the face and body, the chilliness now recedes rapidly, and the heat encroaches, *pari passu*, until it obtains a complete ascendency.

Such are the usual symptoms of the cold stage: its duration is very various, rarely continuing less than half an hour or more than four. It is a fact well worthy of remark, that occasionally when the most intense feeling of universal cold is present, though

the extremities are chilly, the heat of the body itself is above the natural standard.

2. The *hot* stage, which is one of reaction, gradually succeeds the cold, the one running into the other without evident or distinct interval. This stage is characterized by a flushed and turgid countenance: the surface of the skin is dry, and its temperature raised much above the natural standard; Fordyce observed it as high as 105°, while Mackintosh says that he has seen the thermometer, the accuracy of which had been well-ascertained, rise even in this country to 110°, and that in warm climates it is said to rise to 112°. The mouth is dry, the tongue parched, and the thirst excessive; the pulse is full, strong, and free; the respiration hurried and oppressed, though not to the same extent as in the cold stage; the urine is scanty, high-coloured, putrifying soon, but not depositing a sediment. The patient generally complains of acute pain in some part of the body, very often in the forehead and lumbar regions, and not unfrequently in the thorax, left hypochondrium, and extremities. The whole expression is that of restlessness, general uneasiness and oppression about the præcordia: the senses are acute, unless, as frequently happens, delirium supervene a short time before the commencement of the succeeding stage. The hot stage is more irregular in its duration than the cold; it rarely continues less than three hours or more than twelve.

3. The *sweating stage* commences in a perspiration, which, appearing first on the forehead, breast, arms, and legs, soon becomes general and profuse. No statements have been made by the observers of this disease, by which we are enabled to calculate the quantity of fluid thus excreted, but there is reason to believe that it is very considerable. During the course of this stage, the pulse, though it continues full, loses its hardness and frequency; the breathing becomes free and natural; the urine retains its high colour, and deposits a light red lateritious sediment; the bowels are more easily acted on; the heat of the skin subsides; the headache and thirst abate; the appetite returns, and there is a gradual subsidence of the febrile symptoms: in fact this stage continues until a perfect remission, or state of apyrexia, is established. On this taking place the patient is frequently enabled immediately to return to his duties as if in full health; sometimes, however, a profound sleep comes on, which may last for some hours, when the patient awakens refreshed, and free from lassitude; others, however, especially in long standing cases, labour under a feeling of excessive weakness.

The stage of *apyrexia*, or intermission, though it may be entirely free from the phenomena understood to be characteristic of

fever, must by no means be regarded as a state of health. Generally speaking, the countenance is sufficiently expressive of this, having a pale and sickly aspect; the mental and bodily powers are excited only with great effort, and are easily exhausted and fatigued, a general languor pervading the system; the appetite is indifferent, and the digestive functions are carried on imperfectly; there is also a remarkable sensibility to cold, and a want of power to resist its effects, the function of generating and preserving animal heat being evidently deficient.

Such is the ordinary course of the febrile paroxysm, and of the period of intermission in an intermittent fever. Independently of the differences in the relative duration of each of these, and which will afterwards be particularly pointed out, there are other peculiarities which require notice:—

In the cold stage the chills are sometimes very partial, being confined to one or more parts of the body: for example, there are instances of a single limb being the seat of this stage; sometimes again it is so slightly marked as to amount only to the slightest sensation of chilliness creeping along the back, and over the extremities, or perhaps there may be only severe headache, or a lethargic state, or great languor with distressing yawning: occasionally the paroxysm is announced by violent articular, lumbar, or frontal pains, and sometimes the patient falls into a profound sleep for several hours, and awakes in a violent hot stage. (*Mackintosh's Practice of Physic*, vol. i., p. 63.) These forms are vulgarly known by the name of the dumb ague: now and then a nervous pain of the brow following the course of the supra-orbitar nerve, resembling an attack of tic douloureux, takes the place of the usual symptoms; and Dr. Eberle has known this stage to commence with violent vomiting, and to terminate speedily in stupor and partial insensibility. (*Op. cit.*, vol. i., p. 61.)

In the sweating stage the anomalies are frequently very conspicuous: occasionally the pyrexia may have been very intense and prolonged, followed by very slight perspiration, or even only a clammy moisture; sometimes a copious flow of urine, or even diarrhœa, appears to supersede every other symptom. These variations from the usual course were very frequently observed in those who had returned with intermittent fever from the Walcheren expedition. (*Davis on the Walcheren Fever*, p. 19.) Andral mentions the very curious case of a young man who had been hemiplegic on one side of his body from infancy, and who was attacked with tertian intermittent. He only perspired on that half of the body which had not been paralyzed. He stated, however, that in his best health he never perspired but on one arm or leg, and on one side of his face and neck. Instances of irregularity are also on record, in regard to an inversion in the natural order of the cold,

hot, and sweating stages; these, however, are of very rare occurrence. According to Dr. Davis, anomalies were as frequently observed in the intervals. In those who had returned from the Walcheren expedition, he observed that the paroxysms often left the appetite impaired, the rest disturbed, and frequently induced drowsiness approaching to coma, prostration of strength, dejection of the spirits, emaciation of the body, irregularity, sometimes vitiation or suppressions, of the secretions. In a few instances the intermission was protracted for a week or ten days, the patient during this time being harassed with visceral obstruction, while there was disinclination or inability to exercise the mental or bodily faculties. The disease, instead of subsiding, appeared only to cease for a moment, in order, when the paroxysms were renewed, to attack with greater vigour the internal organs, more especially the viscera of the abdomen; and when inflammation supervened in organs previously affected with organic disease, the structural lesions were increased, and quickly induced dysenteric affections and ascites. It has occasionally happened that patients have been seized, after the paroxysm had passed over, with pain in the head, and a confused state of intellect, terminating two or three days afterwards in complete coma: sometimes a continued pyrexia with disorder of the stomach has prevailed, indicated by whiteness of the tongue, distension, epigastric uneasiness, and anorexia; in some, the bowels become painful, with a tendency to diarrhœa, the evacuations being mixed with blood and mucus: in others there are wandering pains of the head, chest, and abdomen, or lumbar pains, strangury, and bloody urine, flushing and œdema of the face, languor, dejection, and general indifference; sometimes the pulse is quick, at other times slow, intermitting, or irregular. In addition to several of these symptoms, the patient is occasionally attacked during the intermission with rigors, slight exacerbations of fever of a hectic kind, followed towards evening by a cold clammy moisture upon the arms and breast, excessive thirst, sometimes palpitations of the heart, cough, and difficult respirations. Whenever these phenomena are present, and a paroxysm is about to supervene, they disappear in the greater conflict the constitution is about to be engaged in: but when the paroxysm has passed over, several of these anomalies reappear; so that the patient even in the interval may never be left perfectly free from very obvious ailments. It is unnecessary to enter more fully into the irregularities which occasionally take place during the intermission. From what has been stated it is apparent, that though during this period or interval the patient may remain free from any uneasy sensation, there may be more or less evidence of undefined indisposition.

The alternations of the period of intermission, with the febrile paroxysm described, have given the name whereby this class of

diseases is distinguished. Experience has taught us that this alternation occurs with a regularity so marked, that we are enabled to infer the time at which the paroxysm will recur. This periodicity generally discovers itself between the close of the first and the commencement of the second paroxysm. Hence is determined the type or form of intermittent fever, to which the particular case belongs, and which it maintains, speaking in general terms, during the whole course of the disease, not only as regards regularity in the recurrence of the paroxysm, but likewise as to the length and severity of the different stages of the paroxysm itself, it being almost uniformly found that the hot stage is determined in its character by that of the cold, and the sweating by the character of the other two together. These exacerbations of fever and intermissions are so well defined and so constant in their succession, as to permit the varieties of the disease to be designated by terms sufficiently expressive of the period of recurrence. Nevertheless, irregularities sufficiently striking occasionally present themselves: sometimes the paroxysm is protracted beyond its proper period; sometimes the regular time for its return is anticipated, or it may be delayed. The phenomena of the disease, however, bear so general a relation to each other, that the following may be almost regarded as its proper or peculiar laws:—1. The shorter the intermission the longer the paroxysm; 2. The longer the paroxysm, the earlier it commences in the day; 3. The more durable the cold stage, the less durable the other stages.

We shall now proceed to describe the *varieties* of intermittent fever:—1. *The quotidian;* 2. *The tertian;* 3. *The quartan;* 4. *The irregular;* 5. *The complicated.*

1. The *quotidian* intermittent is characterized by its intermission occurring every twenty-four hours. In this type of ague the intermission is shorter than in any other, while the paroxysms are the most protracted, occasionally extending to eighteen hours. The paroxysms commence generally in the morning: in fact it is doubtful if the disease can ever be considered a true quotidian, if they commence after noon or during night. They are usually in these cases symptomatic of some local affection. The quotidian but rarely occurs, in fact more rarely than is generally supposed; for hasty observation has frequently led to the confounding with this type the more commonly occurring double tertian. In this latter, however, the paroxysms are not equally severe, the alternate ones bearing a relation to each other, while in the quotidian they each are of similar character.

The paroxysm of quotidian is ushered in by a slight sensation of cold, or rather a chilliness only; it is usually attended by much gastric derangement, as heartburn, nausea, with distension of the

epigastric and hypochondriac regions; the pulse is irregular and weak, the urine pale and thin. In some cases other symptoms supervene, as headache, diarrhœa, or vomiting. This stage commonly lasts about three hours. The hot stage is characterized by thirst and a general warmth, rather than an intense heat; the patient is frequently drowsy; the pulse becomes quicker, but does not acquire hardness; the urine is turbid. This condition lasts perhaps for two hours or more, when a protracted but slight perspiration announces the sweating stage. The whole of the paroxysm occupies about ten or twelve hours. The intermission which succeeds is not entirely free from morbid feeling, the patient usually experiencing some degree of heaviness and mental oppression: it lasts usually for twelve or fourteen hours, but in severe cases it may not exceed six.

The continuance of quotidian ague is much influenced by circumstances, as the age and constitution of the patient, the season of the year—the autumnal and winter attack being always more severe than that occurring in the spring. It is often protracted in its course, especially when it occurs in those of lax weak fibre; its usual progress to a cure being in such cases the transition into a tertian. This type of the disease often assumes many peculiarities: occasionally the paroxysms are so extended, that there is scarcely any intermission, or at all events it is very imperfect; so that the whole period between the paroxysms is not free from febrile symptoms: this has been termed the *continued quotidian.* Dr. Fordyce has particularly described another variation under the name of the *anticipating quotidian,* in which the paroxysm, instead of recurring at its usual time, sets in about two hours before; and this happens in every attack, so that its recurrence may take place at any period of the twenty-four hours instead of at the regular time.

The *retarding quotidian* is the counterpart of the anticipating, its paroxysms being daily postponed for two hours.

2. In the *tertian* ague the paroxysm commences every forty-eight hours; it is the most frequent of all the types of intermittent fever. The paroxysms usually commence about noon, and rarely last so long as eight hours; six are understood to be the fair average time. Their duration is consequently less than in the quartan ague, and in this respect there is a deviation from the general law.

The premonitory signs of the cold stage are, overwhelming languor, continued yawning and stretching of the limbs, creeping sensation over the surface, followed by a feeling of coldness down the back; occasionally, though very rarely, this feeling of coldness commences in one of the extremities, or on one side of the head.

To these symptoms succeed the rigor, which is peculiarly intense in the tertian variety. It is attended by severe general and lumbar pains, and by anxiety and alarm; a feeling of nausea supervenes, and as this increases the pain subsides: vomiting, first of the contents of the stomach and afterwards of bile, succeeds, which is the termination of the cold stage. Though this stage sets in severely it is not of long duration, rarely exceeding an hour, and not unfrequently lasting less than half that time. The succeeding or hot stage, as regards the individual paroxysm, is, however, disproportionately long; it is not characterized by any symptoms very different from the usual hot stage in other agues; the heat is intense, and the thirst continued. It may continue for three hours, when it gradually subsides under the influence of a free perspiration. The period of apyrexia in this form of intermittent is often attended by much general derangement, as weakness, loss of appetite, headache, &c.

Of all the varieties of ague the tertian when uncomplicated by any other disease, is the least dangerous, especially when it occurs in the spring; those that occur in the autumn are more obstinate, and change, at times, into the quotidian, or the double tertian. In favourable cases it may subside after the fourth paroxysm; it often does so after the fifth, but more generally after the seventh or ninth; occasionally the disease subsides on the appearance of a scabby or vesicular eruption; the occurrence of any little cutaneous disease about the nose and mouth may be almost considered as critical. This type of intermittent occurs more frequently in adults than in children, and in those of robust sanguineous temperament than in the leucophlegmatic. It is often complicated with chronic diseases, especially of the stomach and liver, and with dysentery.

The irregularities which occur in tertian ague are very numerous, and of frequent occurrence; they may, in great measure, however, be included under the heads of double and triple tertians.

In the *double tertian* the recurrence of the paroxysm takes place daily, so that two fits and two intermissions occur in the forty-eight hours; and on which account, as previously noticed, it may on slight observation be confounded with quotidian. It differs somewhat from this latter in the paroxysm not occurring in the morning, but more particularly in the alternate ones being similar, while those immediately following each other are not so; thus the paroxysm of the first day comes on at noon, and goes through its stages as is usual in a tertian; on the following day, the period of apyrexia is obtruded upon towards evening by a slighter paroxysm; on the third day the phenomena are the same as occurred on the first day, and on the fourth as on the second; so that the paroxysms occurring on the first, third, and fifth days,

represent those that belong properly to the type of ague, while those occurring on the second, fourth, and sixth days are those which constitute the variety, and are the irregular addition to the disease. Dr. Davis, who says this is the most common type of the fever, describes it as attacking at all hours, generally beginning with nausea, extreme lassitude, and sense of cold, extending from the shoulders to the bottom of the back; that in the cold stage, independent of the usual symptoms, the dejection of spirits increases so much "as in many instances to approach syncope, resembling a fever termed by the ancients *Syncopalis.*" The symptoms attending the paroxysms he has detailed at great length and with much minuteness; but as they are not essentially different from those already stated, it would be useless to dwell upon them here.

Some of the irregularities of the double tertian are not, however, uninstructing. The cold stage sometimes consists of a rigor only, followed, after the space of an hour or two, by great heat, continuing for an uncertain number of hours, varying from six to eight. In the slight and irregular paroxysm, ushered in frequently by rigor and moderate febrile symptoms, the termination is always more confused and incomplete than the severe paroxysms of the previous or following day. On the termination of the fit being tolerably complete, there yet remain symptoms which are very distressing, such as acute pain in the chest, stomach, or head. If the pain in the head continue long, delirium or stupid drowsiness follows, and diarrhœa, sometimes dysentery, and partial suppression of urine frequently occur. In the midst of the hot stage, palpitations of the heart, cough, and vomiting, occasionally supervene, together with repeated hemorrhages from the nose; many of which symptoms persist after the completion of the paroxysm, thus creating considerable confusion during the interval. The duration of the paroxysm is occasionally very uncertain, being much influenced by a complication of anomalous symptoms:—"It has occasionally lasted ten, twelve, fifteen, or twenty hours without coming to any distinct solution; nay, the stronger fit has continued till the slighter one has commenced, the two paroxysms becoming thus identified in one. The interval has in some instances really been so indistinctly marked, that the fever partook much of the continued or at least remittent form." Much irregularity also occurs in respect to the invasion of the paroxysms, now occurring regularly both as to period and duration, and then those immediately following varying in both these respects. Sometimes a variety is established which has been termed the *duplicated tertian*, in which, according to Cullen, two paroxysms occur on alternate days, while the intervening ones are days of intermission. Dr. Craigie describes it somewhat differently, the disease being introduced, according to him,

with a mild fit in the evening, and followed by a more violent and complete one the succeeding day. On the evening of the third day again a mild fit appears once more, and is succeeded by a severe one in the same manner throughout the disease; so that according to the usual mode of calculating the days of disease by reckoning from the first hour of invasion, both paroxysms happen on the odd days, while a great part of the even days is calm and undisturbed.

In the *triple* tertian there are two paroxysms on the odd and one on the succeeding days; so that in forty-eight hours there are three paroxysms and three intermissions. The mode of this occurrence follows somewhat this order. About midday the first paroxysm occurs and lasts for four or five hours; after a short intermission another takes place, which is protracted through the night; then follows an intermission during the greater part of the second day, which towards evening is intercepted by a paroxysm lasting through the night; on the third day the two paroxysms reappear as on the first, and on the fourth day as on the second, and so on throughout the disease.

3. The *quartan* ague is characterized by an intermission, commencing every seventy-two hours, the paroxysm generally lasting from five to nine, and commencing usually in the afternoon between the hours of two and five. Its cold stage is longer in proportion than in the other types, but it is by no means so violent as in the tertian. Dr. Craigie, however, on the authority of Burserius, describes the hands and feet as becoming cold, the whole body pale, the face and nails livid, succeeded by shuddering, and at last by convulsive shivering, trembling of the tongue and lips, frequent and oppressive breathing, with a sense of anxiety at the præcordia, and a shaking of the whole person with irresistible violence. In some instances this degree of cold and shivering does not take place in the first and second paroxysms; but in the subsequent ones it is always very violent, and has been known in some cases to break the teeth or dash them from their sockets. The cold stage is occasionally protracted to a period of two hours, and is very rarely attended by sickness or diarrhœa. After a duration of two or three hours it passes into the next stage, which is not attended so much by intense as by a troublesome dry heat; nor is the concluding stage marked by any very decided perspiration.

This form occurs chiefly in the autumn, very rarely in the spring. The subjects most liable to it are those in advanced years, and of a melancholic habit. Of all the types of intermittent it is the most obstinate and difficult of cure, generally remaining through the winter until the following spring. Celsus has remarked this

particularly to be the case, should this form of ague become established in the constitution before the winter have set in. It is nevertheless a type of fever, which is very rarely attended by a fatal termination.

The deviations from the ordinary course of the quartan bear so much relation to those of the tertian already described, that it is not necessary to enter at length upon them. A few words will suffice to show the nature of these variations:—

In the *double quartan* the true paroxysm takes place on one day, a slighter one on the second, while the third is a day of intermission; on the fourth day another paroxysm takes place, resembling that of the first, and so on in succession. The paroxysms occurring on the second and subsequent fourth days are those which represent the type of the disease.

In the *triple quartan* a paroxysm takes place daily, but they vary on the first, second, and third days; so that, as the disease progresses, the paroxysms which occur on the first and fourth, on the second and fifth, on the third and sixth, and so on successively, are respectively similar. Those occurring on the first and fourth days being the most complete, are the true quartan paroxysms.

In the *duplicated quartan* on the first day two paroxysms occur, while the second and third are days of intermission. In the *tripled quartan* these paroxysms occur on the first and fourth days with two days of intermission. These two latter varieties are of very frequent occurrence, but in their progress towards cure they usually pass into the true quartan.

The irregular agues are those whose periods of intermission are more protracted than in any of the preceding; and though to the hasty observer the recurrence of the paroxysms may appear to be irregular, yet, for the most part, they will be found to obey certain laws of periodicity. In these varieties the intermission which intervenes is protracted through the space of from five (called by Van Swieten a *Quintan*) to seven days, or even to a longer period. Dr. Craigie, however, thinks it exceedingly doubtful that an ague should actually exist with periods of intermission so extended, and at the same time observe any so marked regularity in the accession of its paroxysms.

The whole class of simple agues, together with their varieties, are subject to certain irregularities in their paroxysms, which have given rise to a division into the *cold*, *burning*, and *sweating* agues—the accompanied agues of many writers. They occur, however, most frequently, as deviations from the autumnal tertian.

In the *cold* variety the first stage is protracted, the surface remaining chilly, the pulse depressed, the countenance sunken, and

the breathing anxious; no hot stage is perceptible; it gradually subsides into a clammy perspiration.

The *hot* variety is, in its external symptoms, very similar to the cold, excepting that, whilst the surface retains its coldness, there is felt within an excessive and most excruciating burning.

In the *sweating* variety the cold and hot stages are hurried through, and a protracted sweating stage supervenes. The perspiration is very copious, exhausting, and enfeebling. Each of these varieties is attended by much danger. We shall not, however, enter further into their discussion, as the irregularities in the paroxysm have been already pointed out.

4. In the *complicated* agues, one type may be converted into another—the tertian and quartan into quotidian, or into double or triple tertians; quotidians and tertians into remittents, &c. A variety of the complicated has been termed the *subintrant*, in which the paroxysms approach each other so nearly as to be like remittents, excepting that the exacerbations are more marked.

The above may be stated to be the more usual forms in which intermittent fever occurs. Each type, however, is liable to certain modifications, which have their origin in idiosyncrasy, or the presence of some general affection, or on what has been termed atmospheric temperament. These modifications, from altering very considerably the general character of this class of fever, render a true appreciation of them very necessary in a practical point of view.

The most important of these modifications are, 1. The inflammatory; 2. The congestive; 3. The malignant.

1. The *inflammatory* intermittent is characterized by its intermissions not being free from febrile symptoms, notwithstanding the sweating stage of the paroxysm has been most complete; the pulse retains much of its quickness and tension; the thirst is constant and urgent, the skin harsh, dry, and warmer than natural; the whole tone of the system is irritable; the temper is fretful and discontented; there is headache, and occasionally aching pains transiently affecting the extremities, and sometimes slight pain of the chest, attended by a short cough. In agues thus modified the rigors are exceedingly strong, and generally attended by vomiting. The paroxysms are usually protracted, and the intermissions are proportionally shortened. The quotidians are more apt to partake of this character than the tertians, and the tertians than the quartans. The vernal quotidians, occurring in the young and robust, are particularly liable to become so. Richter has observed that, notwithstanding the general severity of the symptoms, the secretions are rarely so vitiated as to cause gastric disturbance.

2. The *congestive* form of ague is throughout of adynamic character. The cold stage, which is much protracted, is ushered in by vertigo, deep-seated pain of the head, followed by general trembling rather than rigor. The pulse is small and weak, and not unfrequently faintings and coma add to the alarm. The hot stage struggles on slowly, and, as it were, unwillingly, and then is but imperfectly developed; so that, instead of the usual characters of this stage, there is only a low oppressed condition. The sweating stage is scarcely perceptible. The period of intermission is marked by a pale, worn, contracted countenance, general oppression of the system, constricted and anxious breathing, and small, hard, and frequent pulse. The surface of the body is colder than usual, with an incapacity of retaining the surface warmth at the same time that the internal parts feel heated and irritable. This modification of ague, however, seldom occurs, excepting in hot countries, where there is much prevailing marsh exhalation, and then only in those constitutionally nervous and irritable, or whose health has been impaired, and the powers of the system exhausted by previous disease. Boisseau states, that it occurs in quotidians, double tertians, tertians, and quartans; it sometimes takes on alternately these different types, whilst at other times they are irregular. (*Pyrétologie Physiologique.*) The duration of the congestive intermittent is but little known: it occasionally succeeds the adynamic continued fever; though, more frequently, it passes into the continued form. It is a peculiarly fatal variety of ague.

3. The *malignant* form of intermittent fever has been particularly described by Alibert. (*Traité des Fièvres Pernicieuses Intermittentes.*) After the second, third, or fourth accession of the febrile paroxysms, the cold stage becomes either shorter and more intense, or else very much prolonged; and in place of the phenomena usually attendant on the hot stage, urgent symptoms, hitherto not observed, show themselves; or those which had already characterized this stage are much exasperated. The sympathetic phenomena which specially characterize the febrile accession become less apparent, or cease almost entirely, while symptoms of local irritation, hitherto unperceived, become developed. Nevertheless, the paroxysm passes off without any very well-pronounced perspiration, but a fetid odour is often exhaled from the body. The patient in part recovers his powers and appetite, and sometimes even does not complain of any particular uneasiness. On the accession of the succeeding paroxysm, however, colliquative hemorrhages and petechiæ often make their appearance; and not unfrequently death ensues at this period, or the disease may be protracted to the third, fourth, or fifth paroxysm.

Such is the outline of what French writers have termed *Fièvres intermittentes pernicieuses:* they usually occur in warm climates

in persons of broken-down constitution, as well as when the intermittent fever is complicated with organic diseases.

[The subject of the pernicious forms of intermittent fever is one of great interest to the practitioners of an extensive district of this country, where these varieties prevail to a greater or less extent. Those forms to which the term *pernicious* is applied, are, in reality, cases characterized by the greater violence of the accompanying congestions, and where, from the importance of the organs implicated, death is imminent at the third or fourth accession.

A highly interesting account of an epidemic ague, of the *pernicious* variety, occurring in Persia in 1842, has been given by Dr. Charles W. Bell, Physician to the British Mission.* It was essentially a quotidian ague, characterized by intense general congestion of the venous system. The disease had several modes of commencement. "Sometimes it began at once, by the patient becoming suddenly insensible without previous symptoms; at other times it was preceded by formal ague. In many instances, again, the patient would suffer for some time previously from intermitting headache daily increasing, and great want of sleep; he would then have one attack of ague, and, next day, at the same time, would sink down insensible. This was the form of disease from which the greatest number of deaths took place, and obtained for the malady its Persian name tab-i-ghash, or 'fainting fever.' During the insensibility the pulse was feeble and the extremities cold. From this state many were never roused; but if they were, the pulse gradually attained power, and the patient came slowly to his senses, complaining of intense headache and a feeling of oppression at the heart; a low kind of fever then came on which was succeeded by very imperfect perspiration, generally confined to the head and chest. Next day, about the same hour, insensibility returned, and each attack continuing longer than the preceding one, the period of death depended upon the strength of the patient or violence of the disease; most frequently, however, death took place on the third attack. As the end approached the secretion of urine ceased, the efforts of the heart at reaction became feebler, the skin felt like that of a corpse, cold and damp, the body became purple and mottled, and the pulse became less perceptible at the wrist: at length the patient was seized with tetanic convulsions and died. In these cases, as often observed in cholera, the feet began to get warm shortly before death, and just as the warmth had spread up the legs and reached the trunk the patient died. Indeed, were other symptoms wanting, I should consider warmth commencing in the feet while the rest of the body was cold, quite sufficient to mark the case as hopeless." In another form, resembling the *algid* of southern countries, there was "no insensibility,

* [Report on the Epidemic Ague, or "Fainting Fever," of Persia, &c. British and Foreign Medical Review, vol. xvi., p. 558. London, 1843.]

no shivering, little or no perceptible fever, and no perspiration; the primary characteristic symptoms were a fixed pain in the pit of the stomach, extreme tenderness on pressure over the left lobe of the liver and region of the spleen, and extreme tension of the abdominal muscles. One or both of the recti abdominis became hard as a board, continuing for days in a state of constant tension, but without any painful cramps or spasms. Nearly at the same hour each day the patient was observed to become exceedingly anxious and restless, tossing from side to side, sighing and throwing the arms above the head, as in yawning, and the pulse became very small and frequent, and the body damp and cold. By and by, this oppression passed off, the body resumed its natural warmth, and the pulse nearly its natural volume; but this continued quicker than usual, and then to all appearance the patient had very little the matter with him. Each day, however, the oppression of the circulation became greater and the attack continued longer; the pulse now became weaker, and an ice-cold exudation ran off the brow and back of the hands. The struggling of the heart to overcome the load of blood which oppressed it was most painful to listen to,—now almost overcoming the obstruction, the pulse for an instant gaining power, and a partial warmth spreading over the surface; and, again, the force of the heart succumbing to the disease, and the icy coldness—much colder than death—returning. The craving for iced water was incessant so long as this state lasted. The evacuations meantime were bilious, and the quantity of urine daily diminished, and at length ceased altogether. At length the intermission between the attacks of oppression ceased to occur, the pulse was only perceptible at intervals, and the patient, who up to this time had been perfectly sensible and even able to walk to stool, fell into a state of stupor. The skin now became blue and mottled, and the patient gradually sunk or died in convulsions. Here, also, as I remarked above, some time before death took place, the lower limbs recovered almost their natural warmth. In all the cases I saw of this variety there was much feeling of distension of the stomach and inactivity of the bowels, and sometimes a little vomiting." The great and rapid enlargement of the spleen is particularly mentioned. In many instances pain in the region of the spleen was felt before the occurrence of any other symptom. The blood was of a dark, dusky, reddish-brown colour, and in general the serum did not separate from the clot. In those affected with the severer forms of the disease, the blood drawn in the cold fit was always grumous, coming at first slowly or in drops, and coagulating as soon as drawn, even at the mouth of the wound; and no separation of the serum took place. During the epidemic the urine of the people in general was much darker coloured than at other times, while in those who were seriously affected it was, if secreted at all, like porter, and in very small quantity.]

III. COMPLICATION WITH LOCAL AFFECTIONS.

Complicated intermittents, both from the nature of the lesions and from their frequency, are of the highest importance; we shall therefore describe the most prominent local affections.

It is not always easy to determine whether these local lesions are primary or secondary, or to what extent they constitute the danger. It is also to be kept in mind, that some peculiar state of the atmosphere, or the peculiar nature of local miasm, or both, exert a powerful influence on the general character of the fever, while individual cases are greatly modified by peculiar idiosyncrasy: thus, in those of plethoric habit, the brain is much affected, and in such persons there is a tendency to delirium; in those of a nervous or irritable disposition, in addition to the other symptoms, there are spasms and twitchings of the tendons; and individuals who are predisposed to rheumatism suffer much from acute arthritic pains. (*Good.*)

The most frequent complication, and one attended with much danger, is that which is termed the *gastric*, in which there is inflammation of the mucous membrane of the stomach. The symptoms are, excruciating pain in the epigastrium towards the cardiac origin of the stomach, from which Boisseau has called it, *La fièvre pernicieuse cardialgique:* the pain is of a gnawing or tearing character, attended by nausea and sometimes vomiting; the countenance is pale and altered; the pulse is quick and small, or even scarcely perceptible; the skin hot; the tongue dry, brownish yellow or bright red; the urine scanty, high-coloured, and of a yellow tinge; the thirst urgent; to which succeed hiccough, great prostration of strength, impaired vision, and hurried breathing. These symptoms supervene after a short shivering fit at the commencement of the hot stage. When the liver partakes in the morbid action, the febrile paroxysm is preceded by frequent copious evacuations, intermixed with portions resembling broken-down flesh, or dark blood partly coagulated and partly liquid: the fluid which is vomited being of the same description.

The prostration of strength in such cases is extreme; the pulse feeble and small; the voice shrill; and the general surface of the body, but more especially the extremities, cold. On any attempt to rise from the horizontal position, syncope often takes place, an event which is always much to be dreaded, as the powers of reaction are very feeble. According to Boisseau, all the symptoms of the atrabilious or hepatic intermittent indicate violent irritation of the intestines, in which there is more or less intense sanguineous engorgement.

When intermittent fever is complicated with *cerebral* disease, it takes on various forms, the symptoms of urgency being generally, however, referable to the head; acute lancinating pains are felt,

more particularly over the frontal region and in the orbits; the sight is impaired; there is great sensibility to light, the retina appearing to be in a state of the most excessive irritability; there is, at the same time, painful tinnitus aurium, with intolerance of sound; in short, the group of symptoms indicate that the membranes of the brain are inflamed. When coma is superinduced, it generally sets in with a drowsiness towards the end of the cold and beginning of the hot stage; the pulse is slow, at one time full, at another small; the eyes are fixed, the lids half open and immovable; the expression of the countenance death-like; and the patient mutters, replies with difficulty, appears inattentive, asks questions, and then forgets them. During all this time he appears perfectly sensible of the inaccuracy of his mental powers, and appears labouring to collect his ideas. If the coma become complete, the breathing is stertorous. In this state the patient usually remains for the space of one or two hours, and then continues free until the following paroxysm. At other times the paroxysm is accompanied by delirium. This state is attended by thirst, hot skin, feeble pulse, great efforts being generally made at muscular exertion, with constant desire to leave the bed.

Cerebral intermittents have also been attended by convulsions; by epileptic fits (*Lautter*); by spasm of the glottis, resembling in many respects the paroxysm of hydrophobia (*Dumas*); by loss of voice (*Double*); and by paralysis (*Molitor* and *Sonquet*); in fact, when cerebral inflammation takes place as a complication of intermittent fever, all those consequences which are usual on the simple inflammations of the brain and its membranes, are developed during the paroxysm. Dr. Brown (*Cyc. of Pract. Med.*) states, that the symptoms which are distinctly referable to the brain and its membranes, are of two orders—those of spasm or convulsion, and those of coma or oppression. Amongst those of the former, he says, there is not merely the ordinary subsultus of fever, but well-marked convulsive movements, such as the rapid contraction of the flexor and extensor muscles of the forearm, convulsive twitchings of the fingers, occasionally tonic spasms of the same parts or of the lower extremities, so that the flexors and extensors being balanced, the members acquire a tetanic rigidity, firm clenching of the lower jaw, and violent rolling or distortion of the eyes. The signs of diminished sensibility are stupor, from which it is difficult or impossible to rouse the patient; immobility; incapability of swallowing; eyelids wide open; pupils occasionally dilated, sometimes morbidly contracted; pulse sometimes strong and bounding, at others small and feeble; and stertorous breathing. Should both sets of symptoms occur in the same patient, it will generally be found that those of convulsion precede in point of time, though in the close of the disease they are found co-existing. Dr. Brown quotes M. Lallemand as considering the first set of symptoms—those of convulsion—to arise from inflammation of the arachnoid membrane, communicating irritation to a healthy

brain, or at least to one retaining its functions to a certain extent; while the second—those of coma—are due to inflammation of the cerebral substance itself. It is certain that convulsive movements are compatible, and are indeed generally found co-existing with coma, more or less considerable; but the opinion of M. Lallemand is supported by the facts, that in those cases of comatose intermittent, in which there are convulsive movements, the patient is still capable of being roused to a degree of attention, and to display some share of sensibility; and that in cases of coma without convulsion, the marks of cerebral inflammation are more considerable than in those in which convulsions existed. The cerebral symptoms usually come on suddenly, though rarely until after a series of paroxysms have taken place. They require the most prompt and judicious attention; for not only are they frequently followed by a state of complete and permanent idiocy, but occasionally death itself ensues suddenly during a paroxysm. Sydenham, however, who had observed that after a reduplication of the fits and repeated evacuations patients were often seized with madness, states, that as their strength increased and they otherwise began to recover, this state proportionably subsided: but in another place he adds, "it may however be proper to take notice of a considerable symptom, which neither yields to purging, nor any other evacuation, and especially not to bleeding, but is rendered more violent thereby. This is a peculiar kind of madness, which sometimes follows upon inveterate intermittents, especially quartans, and yields not to the ordinary method of cure, but after copious evacuations, degenerates into a lamentable kind of folly for life." (*Works by Swan.*) Mosely states that Dr. Charles Irvine informed him, that when on the Spanish Main, the delirium which commonly came on in the paroxysm of the fever, after a few returns of it, sometimes remained during the intermissions, which soon became irregular from reduplications of the accessions; and that several men wandered about in a frenzy, and died raving mad. Mosely himself says, that he has frequently observed that the mind has been greatly impaired after irregular and harassing intermittents; and sometimes that a temporary insanity ensued. (*Tropical Diseases.*)

[In the *comatose* form, according to Maillot,* the stupor may vary in degree from simple oppression to profound carus. The pulse is full, large, without hardness, sometimes quickened, occasionally retarded; the respiration is slow, noisy, and stertorous. The patient lies supine, and his limbs seem paralyzed; the jaws are firmly locked, and deglutition very difficult; sometimes there are epileptic spasms. These severe symptoms commonly occur unexpectedly in the second paroxysm, no apprehension of their occurrence having been excited by previous symptoms, except it

* [Traité des Fièvres, ou Irritations Cérébro-Spinales Intermittentes, &c., Par F. C. Maillot, D. M. A. Paris, 1836.]

be some slowness of speech in the apyrexia. After the continuance of the comatose stage for an uncertain and variable length of time, the sweating stage supervenes, and the patient slowly recovers, wearing an extraordinary air of astonishment, and seeming to regain his senses one by one. In the *delirious* form, the same authority states, that death may take place suddenly, without the supervention of coma—"life being broken by a sudden shock."]

When intermittent fever is complicated with disease of the *pulmonary organs*, there is generally, during the paroxysm, intense pain of the chest aggravated on inspiration, dyspnœa, cough, thirst, dry tongue, small and quick, afterwards hard and frequent, pulse, general feebleness, and universal chilliness. Cases of this description usually set in with a violent rigor. If there be a sharp pain on either side, it may generally be inferred that the pleura is affected. The state of a patient under such circumstances is imminently hazardous. Dr. Davis states, he never found intermittents so dangerous as when the original fever was combined with pneumonia or hydrothorax. Laennec relates a very interesting case of this nature which is important as establishing the fact, that the physical condition of peripneumony was present during the accession, and subsided afterwards. Towards the middle of the paroxysm the *râle crepitant* was heard, and there was a slight hæmoptoë. Dr. Stokes has likewise detailed a case in many respects similar to this. (*Edin. Med. and Surg. Journ.*, vol. xxxi.)

When complicated only by simple catarrhal affection, the symptoms are not essentially different from the above. The only points of distinction are, that the cough is not dry, the eyes are more suffused, and the face is red and swollen. Should the cough, however, be severe, headache supervenes, and sometimes convulsion, followed by a state of drowsiness.

If complicated with asthmatic symptoms, though there be no pain, yet the respiration is so difficult as to threaten suffocation. This symptom is most alarming. In these cases, although there is much short and distressing cough, there is no expectoration.

When complicated with disease of the *heart*, there is palpitation with pain in this region. These symptoms occasionally exist to so great an extent as to induce those indefinable sensations which precede syncope. All the senses but that of hearing are abolished, and the patient attempts to speak, but cannot. During this state the arterial pulse and respiration appear to have entirely ceased, and the beatings of the heart are very feeble and slow. This state usually lasts for a quarter of an hour; at times it is protracted to an hour or even two.

In that variety which is termed the *syncopal*, the patient loses knowledge of all impressions for a short time; and, on recovering, complains of no pain nor other inconvenience, excepting that re-resulting from extreme languor and feebleness. The symptoms

attending a paroxysm of the fainting ague are small, depressed, and frequent pulse, hollowness and dullness of the eye, the head and neck being covered with a most profuse perspiration. It generally proves fatal after five or six attacks.

Disease of the *spleen* is very frequent in intermittent fever, so much so that certain alterations in its structure have acquired the name of *ague cake*. Dr. Davis thinks that the diagnosis may be deduced from the "leaden green and bloated appearance of the face, the debility and listlessness of the whole body, as well as from the accessions of fever which are truly hectic."

[Enlargement of the spleen, though not a constant, is an ordinary accompaniment of intermittent fever of any duration. In 161 cases of intermittent fever, Dr. Piorry, found the spleen to exceed the normal size in 154. It is said to occur much more frequently after tertians and quartans than quotidians. When inconsiderable, any increase in size can only be ascertained by percussion; but when the organ projects beyond the costal margin, it is readily detected by palpation. It sometimes extends as low as the umbilicus, and may reach to the crest of the ileon. Dr. Piorry, who has paid great attention to the condition of the spleen in ague, asserts that in about one-half of the cases, pain, or a feeling of heaviness, is complained of in the left hypochondriac region. At other times these sensations are only elicited by palpation or on percussion.]

This list of the complications of intermittent fever with local disease might be greatly extended: we might detail the *icteric*, the *cystic*, the *uterine*, the *algid*, the *petechial*, &c.; in fact, authors might be quoted who have described its occurrence under a vast variety of anomalous circumstances, and in conjunction with the symptoms and lesions of almost every local and general disorder. To enter upon these, however, would be very tedious, and rather curious than useful. We may, however, incidentally remark, that the peculiar affection of the nerves termed *tic douloureux*, often takes on a very marked periodicity; and that its occurrence under such circumstance in the branches of the supraorbitar nerve, has acquired the term of *brow ague*.

[The *algid* form (with prolonged and icy coldness), of pernicious intermittents is very peculiar. Dr. Maillot contends* that it is not an indefinite prolongation of the cold stage. He says in the first stage of an intermittent, the sense of cold experienced by the patient is out of all proportion to the actual reduction of temperature; whereas, in the algid fever, although the skin is icy-cold, the patient does not complain of coldness. And this cold state supervenes after reaction has commenced, and often suddenly. The circulation becomes disturbed, lowered, and the pulse can scarcely

* [Maillot, loc. cit.]

be felt, the temperature of the body at the same time rapidly decreasing. The extremities, the face, the trunk, become cold in succession, the abdomen remaining longer warm. The skin has the coldness of marble. The tongue becomes pale, moist, and cold, the lips are without colour, and the breath is cold. There is no thirst, and attempts to drink often excite vomiting. The actions of the heart become feeble, and only appreciable by auscultation. The intellectual faculties are undisturbed, and there is a sense of repose which is agreeable to the patient. All facial expression is lost. With this state, cholera may become conjoined, and the eyes then become hollow, glassy, and surrounded by a bluish circle. The approach of the algid form is so insidious as often to be mistaken for a remission produced by blood-letting, and the practitioner is only undeceived by the suddenness of the death of the patient. This deceitful calm is very strongly pointed out by M. Bailly, in his chapter on Diagnosis: he says that the patient may be walking about a few instants before his last attack: the accession is sudden; he lies down, and dies in few hours. Even when the pain (of the abdomen) and the danger are both considerable, the face has an appearance of calmness, as if its expression was no longer associated with the sufferings of other parts. Whenever, says Dr. Maillot, a sudden retardation of the pulse succeeds to reaction, and there is paleness of the tongue and discoloration of the lips, we should not hesitate to pronounce the case algid. Temporizing measures will be followed by death in a few hours. The patient dies as by an arrest of the innervation. If death does not take place, the pulse rises, the skin reacquires its natural warmth, and sometimes irritation of the brain or intestinal canal succeeds. Even this dangerous affection sometimes yields to remedial measures. The resemblance between this condition and cholera is commented upon by Dr. Maillot.]

IV. DIAGNOSIS.

The diagnosis in intermittent fever is by no means difficult; the only affections with which it may be confounded are remittent and hectic fevers; the former, however, never has a complete apyrexia, nor are the cold and sweating stages very perfectly pronounced. In hectic fever the accession takes place daily, and in the afternoon or towards night, thus differing from the quotidians and double tertian, the only forms of ague likely to be mistaken for it. Besides, in hectic fever, the sweating stage is more prolonged, and the pulse, during the intermission, retains more of its febrile character, continuing small and rapid.

V. PROGNOSIS.

The prognosis in intermittent fever depends on a variety of circumstances. The probable result is in some degree influenced by the type of the fever itself, by its epidemic character, by the age and constitution of the patient, and by the situation in which he resides.

In general terms we may state, that in England intermittent fever, when uncomplicated with local disease, is to be considered amongst the least dangerous of the class to which it belongs: it must be borne in mind, however, that occasionally the simple intermittent proves fatal, and then generally in the cold stage. The history of such an event usually is, that cerebral congestion ensues, which terminates in coma or apoplexy. This is especially the case where a predisposition to cerebral fullness has previously existed. In those countries, however, where, to the baneful influence of excessive temperature, are added the effects of marshy swamps, these fevers prove eminently fatal, ever showing a tendency to pass into the malignant or remittent forms.

When intermittent fever occurs in those who are young and of vigorous constitutions, it is much less dangerous than in those who are weak and debilitated, or whose habits have been dissipated. Death amongst these latter frequently ensues during the cold stage, from their stamina not being equal to effect that degree of reaction which is necessary to rouse the system from its depressing influence; and they succumb to the coma which is thus induced. The form and pathological condition of the fever itself likewise influence the result: tertians are the most easy of cure, quartans the most obstinate, but the least fatal, while quotidians are the most fatal. As in other acute diseases, we find epidemic influences giving to ague at one time a character of fatality which does not belong to it at another.

Its complications with other diseases, and its assuming of itself the malignant form, are circumstances which must be well weighed before pronouncing an opinion as to the probable result. Supposing, however, all things to be equal, it may be stated in general terms, that the favourable signs are, regularity during the progress and in the recurrence of the paroxysms, or in their being retarded; complete reaction after the cold stage during the intermission; the digestive organs performing their function properly, especially if there be present no signs of inflammation in the stomach or intestinal canal; the return of discharges which had been suspended; the appearance of scabby and humid eruptions about the nose and mouth, &c.

The circumstances which indicate an unfavourable prognosis are, irregularity in the recurrence of the paroxysms, especially if they become anticipated, or show a tendency to assume the remit-

tent and continued forms, which changes are particularly favoured by whatever is capable of causing or augmenting the general inflammatory condition of the system, or by the supervention of some local inflammation. These complications have been shown to be particularly severe in their nature, and are generally fatal. An unfavourable character of disease during the paroxysm is indicated by general weakness, difficult and oppressed respiration, hiccough, sighing, coma, and delirium; and, during the intermission, by debility of the stomach, deranged digestion, tumid and hard abdomen, loss of strength, tendency to dropsical effusions, difficulty of generating or retaining warmth, dyspnœa, bloody urine, &c.

The *terminations* of intermittent fever are very various, depending much upon the constitution of the patient, the duration of the disease, and the virulence or intensity of the exciting cause. The conviction of those who have had ample opportunities of witnessing the occurrence of these diseases is, that there exists a natural tendency in them to terminate favourably of themselves. Dr. Eberle states, his own observations have led him to conclude that, if not controlled, or embarrassed by external influences, quotidians when simple and regular show a disposition to complete their course on the seventh day; tertians on the fourteenth; while quartans generally run on to the sixth week. It is not to be expected that, under such circumstances, they will always terminate spontaneously at these several periods; but that their tendency to do so is so strong that, if assisted by a febrifuge, the disease will most probably be arrested. It is a curious fact in the history of intermittent fever, that occasionally a continued and obstinate autumnal ague is superseded by the milder vernal one, which running its usual course terminates in health, and apparently quite uninfluenced by the previous disease. We have alluded to the frequent termination of agues in a scaly or vesicular eruption, which makes its appearance about the nose and lips: its occurrence is considered critical.

Should the intermittent, instead of presenting this favourable history, be protracted, a state of impaired health becomes established. The condition of those who are thus labouring under its sequelæ is sufficiently marked. The countenance is pale, bloodless, puffed, and œdematous; the skin is generally opaque, sallow, and inelastic to the feel; the eye is yellowed; the tongue furred, with a creamy slime in the centre; the pulse feeble, frequent, and peculiarly small; the whole appearance is exsanguineous; the appetite is capricious, and the system easily excited by ingesta which are a little stimulating; the alvine discharges are clay-like, or else of a dark liquid character, and always very offensive; the urine is deficient in quantity and tinged with bile; perspirations are easily induced, and of a fetid character; the epigastrium and hypochondria are tumid and tender to the touch; the respiration is short; and the whole expres-

sion is that of debility and weakness. This state frequently continues for years, under greater or less aggravation; ultimately, however, it terminates in dropsy or diarrhœa, which quickly puts an end to the sufferings of the patient.

In hot climates death frequently takes place during the paroxysm. In the more temperate, the disease, when of a bad character, is prolonged and obstinate, giving rise to visceral disease. This is easily understood if the phenomena of the different stages of the paroxysm are borne in mind. It is very obvious, from the condition of the circulating system during the cold and hot stages, how a long continuance of the fever may produce disease of the liver, spleen, and pancreas; how the intestinal canal becomes the seat of severe secondary affections; and how irregularities in the functions of the heart and circulating system generally are established, and dropsy and other evils follow in the train. In the cold stage there is an evident remora of the blood, especially in the veins of the abdomen and portal system; hence arises immediate disturbance in the functions of the liver, as is fully shown by the dark-coloured dejections immediately following an attack. General reasoning sufficiently leads to the conclusion that this should be the case, but the fact is almost established by the greater derangement in the biliary functions which takes place in the quartan ague—the type in which the cold stage is the longest. In the hot stage the abdominal viscera are generally in a state of congestion, and thus prone to take on inflammation, and the lesions consequent to it.

When death ensues, it occurs either from the severity of the general disease overwhelming the vital powers, or from these being worn out by the effects of some local lesion. Under the former circumstances it appears that the annihilating shock takes place either in the cold or hot stages, or during the intermission. Sydenham speaks of it as occurring most usually in the cold stage, when he terms it "death by paralysis." In the quartan type of ague it certainly does frequently happen during the cold fit; not so, however, in the others, which constitute the larger number of cases: in these it most usually takes place during the hot stage, or, according to Dr. Davis, in the period of intermission.

VI. ANATOMICAL CHARACTERS.

The morbid appearances most frequently met with in patients dying during the course of intermittent fever are, inflammation of the serous membrane and substance of the brain, and disease of the liver, spleen, and stomach. From the dissections published by Bailly, (*Traité Anatomico-Pathologique des Fièvres Intermittentes simples et pernicieuses,*) it appears that in nearly all he examined, the previous existence of inflammation of the arachnoid was indicated by the most vivid injection; in some cases it was

evidently thickened, and as if doubled by sanguinolent false membrane. In many instances, on cutting into the cortical part of the brain, the divided surfaces presented an undue vascularity, being immediately covered with an infinite number of small drops of blood. In some cases the colour of the cineritious matter is deeper than natural, even approaching to a dark reddish gray; red spots are very frequent, and occasionally softening has been observed. The vessels of the brain generally are often distended and gorged with blood, the lyra especially being fully injected. Serous effusion is frequent among the convolutions of the brain; and at times, though more rarely, it is found in the ventricles.

The lungs are generally healthy; they have, however, in some few cases, been seen gorged with blood. The heart has also been found distended and flaccid.

The liver is a frequent seat of lesion. Dr. Davis says, dissection has shown that the organs primarily affected are the liver and the spleen. In subjects who have expired of this disease, even in its early stage, these viscera have always appeared to be materially altered in their structure. (*Op. Cit.*) The liver has been found enlarged even to a very great size. Grottonelle relates a case, where it had increased to such an extent as completely to mask the stomach and intestines, the left portion extending into the hypochondrium of that side and adhering to the spleen, so that it could not be separated without being torn. The structure of this immense mass appeared to be, nevertheless, perfectly normal. (*Ad acutas et chronicas Splenitidis eidemque succedentium morborum Historias Animadversiones.*) Sometimes the density of its structure is increased, sometimes it is diminished; it is generally found gorged with blood, thus presenting a purple or deep black appearance. Bailly speaks of having met with it presenting a character as if composed only of black blood slightly coagulated, and of cellular bands, which alone offered some resistance to the pressure of the finger. Where this weak resistance was overcome, the liver was but of the consistence of thin jelly; for the blood appeared effused in its tissue, which resembled a pulpy mass, in no way identical with its natural parenchymatous structure. In another case mentioned by this physician, the liver was putrid and tubercular. This lesion commenced towards the convex part, and extending itself on all sides, descended towards its concavity; nevertheless, the greatest destruction of texture was on the convexity, the remaining portion being engorged and inflamed. Its volume was natural. Occasionally purulent deposit has been found in the hepatic structure. The hepatic ducts are often found injected, thickened and distended with a dense, dark-coloured, viscid bile, as is likewise the gall-bladder, the inner surface of which is occasionally inflamed and ulcerated.

But of all the lesions which are met with in fatal cases of inter-

mittent fever, those of the spleen are most frequent.* This organ appears to be singularly often affected: its most usual character is increase of bulk and consistence; its structure is easily torn, its interior being found to be broken down and composed of a blackish-red pulpy mass: sometimes it is of a gray colour. Morgagni mentions a case in which the spleen weighed eight pounds; and another is related by Bailly, in which it weighed nearly ten, the structure being entirely converted into a pulp. [Dr. Copland mentions a case which came under his notice where the weight was nearly eleven pounds.] The spleen has been occasionally found ruptured by a longitudinal fissure, and the broken down and altered tissue in the cavity of the abdomen. In one case there were fifteen or sixteen ounces of dark blood, resembling oil, among the intestines. In this case the spleen was ruptured at its inferior part by an opening, the size of a dollar, from which issued a dark puriform substance: it was impossible to raise the spleen without breaking it; and it was so diffluent that it separated into two portions, one of which, when placed on the table, became flattened like jelly—the other remained attached to the diaphragm, which it was necessary to cut out in order to expose the spleen completely. In volume it was not much increased.

When rupture of the spleen takes place, the grumous blood is found in the cavity of the abdomen, sometimes unmixed, at other times it is diluted by a sanious bloody effusion, evidently the effect of serous inflammation. Dr. Davis speaks of suppuration and ulceration of the spleen, but does not think that, unless these lesions have become established, or that in weight this organ amounts to from two to five pounds, they prove the source of much secondary disease; nor does he imagine that this or any other lesion is ever the cause of the primary fever. When lesion of the spleen is met with in other organs, generally the spleen and pancreas have almost invariably undergone some change in structure.

The pancreas is often hardened, so as almost to resemble scirrhus.

The stomach, especially the pyloric orifice and great curvature is a frequent seat of inflammation, the characteristic appearances varying according to its intensity and duration. Similar inflammatory appearances are occasionally observed in the intestines, but more particularly in the duodenum. Intestinal ulcerations are rarely seen, unless dysentery have accompanied the fever.

According to the observations of Morgagni, Sydenham, Pringle, Bailly, Fellows, Chisholm and Cleghorn, such are the appearances observed on dissections in fatal cases of intermittent fever. The last-mentioned writer sums up the question by saying, "I have examined the bodies of nearly a hundred persons who

* [The healthy dimensions of the spleen are given by Dr. Piorry as follows:—In its vertical diameter it is from 3½ to 3¾ inches, and in the transverse 3 inches. Its increase of size is usually proportionate in all its dimensions.]

perished in these fevers, and constantly found one or other of the adipose parts in the lower belly (the caul, mesentery, colon, &c.) of a dark black complexion, or totally corrupted; the *vesica fellea* full and turgid, and the stomach and intestines overflowing with bilious matter; the spleen larger, sometimes weighing four or five pounds, and so excessively soft and rotten, that it had more the appearance of coagulated blood wrapt up in a membrane, than of an organical part. In the cavity of the head and breast nothing extraordinary was met with, excepting yellow serum when the skin was tinged with the same colour.

M. Bailly gives the following numerical statement of the different lesions. He found in thirty-three cases more or less extensive disease in the brain; in twenty-two of these there was thickening and other marks of inflammation of the arachnoid coat, and in eleven inflammation of the substance of the brain. In twenty cases there was gastro-enteritis, in four gastritis, and in four enteritis uncomplicated with gastritis. In eleven the spleen was softened; in some instances it was enlarged, one weighing from two to three pounds, and another from eight to ten pounds; in two cases the spleen was enlarged and hardened, in three it was ruptured, and in one gorged with blood. In two instances the liver was softened, in four it was gorged with blood, and in one inflamed. In two cases there was pericarditis, in three peritonitis, in one there was pneumonia, and in another inflammation and enlargement of the parotid.

VII. STATISTICS.

As writers on intermittent fever have not generally devoted much attention to the statistics of intermittent fever, we are unable, from the very few available materials, to present a very satisfactory sketch of them. Few, however, as they are, they are interesting.

[Among the cases of intermittent fever observed by Dr. Maillot, 1582 were quotidian, 730 tertian, and 26 quartan. Of these 2338 cases, the accession took place between midnight and noon in 1652, and between noon and midnight in 686. The greater number of accessions occurred between nine in the morning and noon. 658 were simple, and 1680 were complicated. In 1078 instances the intestinal canal was affected: alone in 343 cases; with the brain in 686 cases; with the lungs in 31 cases; with the brain and lungs in 13 cases. In 25 cases the spleen alone was diseased; and in one case the peritoneum alone. The brain was affected alone in 466 cases; the spinal cord in 1: the lungs alone in 103 cases; and the pleura alone in 5. In one case, a tertian, there was angina with the formation of a false membrane, and no other lesion. The intensity of all the complications was in direct ratio to the elevation of the temperature.]

All ages appear subject to this type of fever, though some periods of life are more prone to it than others. In infancy it is a very rare disease. Schenck relates a case which he terms congenital, in which the paroxysm of an intermittent appeared immediately after birth; and Paullini details another in which it appeared in very early infancy. (*Obs.*, lib. vi., n. 36.) And Lind, when showing the analogy between the intermittents of England and hot climates, says, that even infants at the breast are not exempted from it. (*Diseases of Hot Climates.*)

The type of ague appears greatly to depend upon age. The quotidian occurs most frequently in early life or in advanced age, while the tertian is rather a disease of adult life, and the quartan of adults and the aged. Andral has given the following table, showing the ages at which fifty-six cases of intermittent fever occurred, under the care of Lerminier, in the Hôpital de la Charité. Of four patients at the age of 15, three were cases of quotidian or double tertian, and one of quartan; of five between the ages of 16 and 20, four were cases of quotidian or double tertian, and one of tertian; of nineteen between the ages of 20 and 25, ten were cases of quotidian or double tertian, five of tertian, two of quartan, and two of erratic ague; of fourteen between the ages of 25 and 30, six were cases of quotidian, five of tertian, and three of quartan; of six between the ages of 30 and 35, three were cases of quotidian or double tertian, two of tertian, and one of quartan; between the ages of 35 and 45, there was one case of quartan; of three between the ages of 45 and 50, two were cases of tertian and one of quartan; between the ages of 50 and 55, there was one case of tertian; between the ages of 55 and 60, there was one case of quotidian; at the age of 61, there was one case of quotidian; and one of tertian at the age of 68. On comparing this with other statements given by Andral as to the frequency of simple fever, it appears that both classes are most common between the ages of 20 and 25; that continued fever occurs most frequently between 15 and 20, but very seldom between 25 and 30, which is exactly the reverse of what takes place in intermittent fever. Martinet says, at first sight it may appear strange that persons from 20 to 25 years of age should be so susceptible of these diseases. An adequate explanation of the fact, however, is given, as a majority of these cases consisted of young persons who had come from the country to seek employment in Paris, and were exposed to privations, disappointment, fatigue and unwholesome food, the usual predisposing causes of fever.

Sex appears to have no other influence than is to be accounted for by the difference in modes of life. The quotidian occurs more frequently in women of inactive habits than in men. Sir George Baker, in his account of the epidemic in the fens of Lincolnshire in 1780–1, mentions, as worthy of notice, that in many families, the female servants were nearly exempt from the tertian intermittent,

while very few male servants, especially the labourers in the open fields, escaped.

The constitutional temperament appears to influence very much the type of the disease; the quotidian most usually occurs in those of a languid and delicate habit, and in whom the fibre is lax and but little irritable; the tertian is most frequent in the robust and sanguine, and in those who are liable to derangements of the alimentary function; while the quartan occurs in those of phlegmatic constitution, in the melancholic, in those whose health is impaired by study or intemperance, and in persons subject to hemorrhoidal discharges.

Of the influence of particular occupations little can be said, excepting that it is very evident, that those who are working in or near the marshes, whence arise the peculiar miasms, are particularly prone to the disease.

Climate appears to exert a very notable influence in warm latitudes, where observation has amply proved that this class of fevers is more fatal than in the temperate and cold. In the former they are apt to destroy by the violence of the symptoms during the paroxysm; in the latter they put an end to life by their obstinacy and continuance, and by the visceral disease and debility which they induce; situation also affects both the type and character of ague. It is particularly a disease of moist situations, a continued residence in which frequently converts a tertian into a double tertian or quotidian. Sir John Pringle says, that ague is ever more regular in those situations where the moisture is pure, and unmixed with exhalations issuing from organic matter in a state of elementary decomposition. It is not a little singular, however, that during the years 1800–1802, when intermittent fever so much prevailed in England, while the inhabitants of the high grounds were harassed by this fever in its worst forms, those of the subjacent valleys were not affected by it. Sir George Baker and Sir Gilbert Blane noticed particularly that the people of Boston, and of the neighbouring fens, were in general healthy at a time when this fever was epidemic in the more elevated situations of Lincolnshire. (*Select Dissections.*)

Season exerts a most undoubted influence; so much so, indeed, that some writers, more especially Sydenham, have been induced to found upon the effects it produces a system of classification—hence the origin of the terms vernal and autumnal agues. In no known country, where intermittent fever prevails, has this influence been found wanting. Agues are never found to be equally prevalent at all periods of the year. In temperate climates the order which they follow may be stated as follows:—A comparative freedom from disease is enjoyed between the winter and spring quarters; shortly after the spring season has commenced, agues make their appearance, and continue to increase until immediately after the summer solstice, when there is a short period marked by a most

decided decrease of disease, followed immediately by more numerous and severe cases, which continue during the autumnal equinox, but subside towards winter. The quotidian is most prevalent about the end of winter and during the spring; so very generally is this the case, that SYDENHAM says he never saw a genuine quotidian in autumn, and doubts whether it ever occurs excepting at the spring time. The tertian occurs at all seasons of the year, but it is most frequently observed to prevail in the months a little after the summer solstice until the winter has fairly set in. In the depth of winter their frequency is very much diminished; to a certain extent they again occur towards the spring, and again subside as summer advances. Intermittents occurring at this latter season are comparatively mild, while the autumnal disease is often obstinate, and gives rise to serious results. The quartan ague may almost be termed an autumnal disease, almost universally occurring between the equinox and winter solstice. It is rarely or never met with as a vernal disease, unless it have been a latent autumnal ague, or is consequent upon relapse. Amongst those who suffered from this disease during the Walcheren expedition, in the advanced stages the influence of the weather was remarkable. (DAVIS, *op. cit.*) In the beginning of October, when the weather was fine and dry, no modification of the disease arose from the complication of accidental complaints with it. The disease advanced, and its consequences succeeded in a certain order, its fatality depending upon its own force, and the extensive mischief it produced in the viscera. In November many inflammatory affections of the lungs and bowels occurred, and sometimes rheumatism; during the height of which the paroxysms of ague were suspended, but recurred when those diseases abated. The intermittent, for a time, gave place to continued pyrexia, which in its turn was carried off by an accession of ague. As in the preceding month, the intermittent offered varieties in its appearance, depending upon its own character and not upon any modification from the weather. At the latter end of November, and the beginning of December, accidental combinations were less frequent; still there were some inflammatory affections of the throat and chest, which now and then became difficult to manage.

Of the fifty-six cases given by ANDRAL there occurred in January, February, and March, nine (three quotidians or double tertians, five tertians and one quartan); in April, May, and June, ten (one quotidian or double tertian, five tertians, three quartans, and one erratic); in July, August, and September, seventeen (ten quotidians, or double tertians, six tertians, and one quartan); and in October, November, and December, twenty (fourteen quotidians or double tertians, three tertians, two quartans, and one erratic).

BAILLY asserts that intermittent fever is entirely confined to the human species—the lower animals never suffer from it. In situations where the influences producing this disease prevail, animals

in common with man suffer; but the morbid phenomena never assume in them the character of an ague—the fever being invariably a continued one.

VIII. NATURE.

The nature of intermittent fever is very obscure. The inquiry naturally resolves itself into the consideration of, 1. The proximate cause of the paroxysm; and, 2. The laws which govern its periodical recurrence. With regard to the former, various theories have been formed. Some writers consider that intermittent fevers depend on local inflammation of an intermitting character; Broussais ascribes them to inflammation of the mucous membrane of the digestive canal; Mongellaz and Boisseau to inflammatory irritation of any of the abdominal organs. To these views it may be objected, that the symptoms are not referable to the usual laws of local inflammation, as it regards its fixity; and that, in fatal cases, the effects of inflammation are not discoverable by dissection. There can be no doubt that, during the paroxysm of ague, congestion takes place; but this is not only not identical with inflammation, but an effect and not a cause of the paroxysm.

Again, it has been supposed that the phenomena are produced by the influence of the specific causes on some portion (according to Hildenbrand, the ganglio-splanchnic) of the nervous system.

Some have assumed that intermittents, in common with other forms of fever, depend on congestion of the capillary system. It is probable that the structural changes which take place in the several organs are immediately owing to this cause; and that, during the progress of the fever, these vessels are incapable of performing their functions; but it by no means follows, that the action of the primary febrile cause is exerted in this system; and that, if it be involved at all, it is only secondarily. As the investigation, however, is intimately connected with that of the proximate cause of fever in general, we forbear going more at length into this obscure subject.

It would be useless to enter into any discussion on the various vague theories which have been proposed with the view of explaining the cause of the intermittence of agues. It is much to be regretted, that no satisfactory explanation of phenomena so remarkable has been given. It, therefore, appears that the nature of intermittents, as well as the laws which govern their periodicity or intermittence, is involved in the greatest obscurity.

[IX. STATE OF THE BLOOD.

From the analyses made by Andral and Gavarret of the blood in this disease, instead of being in a state of hypinosis, the blood

exhibits rather a tendency towards hyperinosis. Andral and Gavarret remark that in consequence of the absence of all disturbance in the normal functions of the organism during the remission of the febrile symptoms, it might be concluded *à priori* that no peculiar changes would be exhibited in the blood. The fibrin rises a little above the normal average; the corpuscles, however, with the exception of one case in which the bleeding was ordered at the commencement of a second attack, fall below the normal proportion. The blood in most of these cases was, however, taken from persons suffering from long standing tertian or quotidian fever. The period at which the blood was taken, whether during the remission, the hot or the cold stage, seemed to exert no influence on the composition of the fluid. It will be sufficient to give the maxima, minima, and mean of their researches.

	Water.	Solid residue.	Fibrin.	Blood corpuscles.	Residue of serum.
Maximum - -	847·9	221·9	3·8	127·9	91·0
Minimum - -	778·1	152·1	3·0	68·8	71·6
Mean of 7 analyses	811·4	188·6	3·3	104·3	80·0]*

X. EXCITING CAUSES.

It has been proved by evidence the most complete, that excepting on very rare occasions, intermittent fever is caused by a morbific agent which has been termed marsh miasm, or paludal exhalation. Many attempts have been made to arrive at a knowledge of the physical qualities of this agent. Moschati and Broschi examined the atmosphere—the former of some very insalubrious rice-fields, the latter of an unhealthy spot in the papal states; from which it appeared that it contained albuminous flocculi, somewhat viscid in appearance, but the nature of which was not understood; and that it possesses a certain weight, as it does not appear to rise in the atmosphere, unless mingled with it by currents of air. All that is valuable on the constitution of the atmosphere of those places where ague is prevalent, may be summed up from the results of the extensive investigations made by M. Julia:—1. That the air of these several situations contains the same principles, and in the same proportions, as the purest air of the most healthy situations. 2. Marsh air contains a principle which eludes the test of the most delicate chemical reagents. 3. Though the nature of the noxious vapour is unknown, there is reason to believe that its pernicious effects depend on a form of vegetable and animal substance in a state of decay, or on a solution of these substances in air, or on the gases resulting from their decomposition. 4. Experiment has not yet demonstrated in marsh air the existence of azotic gas, carburetted hydrogen, or ammoniacal gas, or any of the gaseous products of decomposition; and if they are present in this

* [Simon's Animal Chemistry, p. 247.]

vapour, their quantity is too small to be appreciated. Whatever its constitution or essence may be, it at any rate appears evident, that in order to its production, there must be present a certain quantity of moisture, vegetable or animal matter in a partial state of decomposition, and a degree of temperature which may not be termed cold; for we see that it prevails in districts where such conditions obtain—in the extended estuaries of rivers, in swamps which pass, under the exhaling influence of the sun, into a comparative state of dryness, on the banks of rivers subject to floodings, and on low flat sea-shores.

It also appears evident, that the influence of the infected atmosphere varies in intensity according to its distance from the source of miasm. Thus we are often enabled in the vicinity of marshes to trace the various grades of miasmatic fevers, from the most violent and fatal to the most simple and mild varieties, as we progressively remove from the focus of the deleterious exhalations to the circumference of its influence. It is for a like reason, viz., the intensity of the miasm, that on the first appearance of a miasmatic disease they are comparatively slight; while, as the season advances, they become more severe and fatal, and again gradually diminish as the advance of winter controls the elimination of the specific poison.

It has been observed that in rare cases other causes are the means of generating fevers of an intermittent type. Richter speaks of its being caused by worms and other sources of intestinal irritation, by suppression of the catamenia and habitual discharges. We have seen a case of true tertian occurring in a girl of nine years of age which was most undeniably referable to fright. Bailly and Audouard in France, and Cleghorn and Fordyce in our own country, have maintained an opinion, that it is communicable by contact; and Dr. Brown says, that cases have fallen under his observation which have led him to entertain at least a suspicion that such was the fact; and he quotes from Bailly a case which he thinks most forcible:—"A lady arrived in Paris with an intermitting fever, which she had contracted in the country in a marshy situation. Scarcely was she cured, when her husband, who had never quitted Paris, but who had had the imprudence not to keep himself apart from her during her illness, was struck with like symptoms, and in a manner altogether similar."

XI. TREATMENT.

Before detailing the measures to be adopted in the treatment of intermittent fever, it is proper to point out the great importance of removing the patient, if practicable, from the situation whence the malarious poison has been derived. The difficulty of curing ague when the patient is obliged to remain in a malarious district, and the comparative ease with which the symptoms are often removed

in a pure air, render it expedient to adopt at once this important measure.

The treatment is divided into that, 1. Of the paroxysm; 2. Of the interval; and, 3. Of the effects or *sequelæ* of the disease.

During the paroxysm the utility of assisting nature, and of counteracting morbid action, is plainly indicated. The natural efforts are to be assisted in superinducing upon the cold stage a quick reaction or the hot stage, and afterwards in converting the hot into the sweating stage. The morbid actions to be guarded against are, the congestive, inflammatory, and weakening effects, which have been detailed above.

1. In the cold stage warm diluent drinks are to be freely exhibited, while the application of warmth to the external surface is to be assiduously employed by means of warm clothing, bladders filled with hot water, and similar means. Various internal remedies are to be administered at the same time. An opiate given a little before the accession of the cold stage, or during its continuance, has been found most serviceable; it controls the convulsive shaking, quiets the pain, and relieves the mind from the peculiar irritability which characterizes this stage. The combination of an antimonial with the opiate has been found to assist its operation. The exhibition of an emetic on the first feeling of languor, followed by copious draughts of the warm infusion of chamomile, pennyroyal water, or balm tea, has been much recommended; and there can be no doubt that this treatment is generally followed by satisfactory results.

The practice of blood-letting during the cold stage has been strongly advocated in recent years, more especially by the late Dr. Mackintosh, of Edinburgh.* In those cases where it has been employed, there can be no doubt that it cuts short the paroxysm; but, take it in all its bearings, it is not a mode of treatment to be recommended. The consequences of its employment may be thus estimated: that, though favourable as far as the individual paroxysm in which it is employed is concerned, it is injurious as regards the whole disease. Dr. Stokes, after patiently and fairly examining the subject, states, that he apprehends an impression will be received, certainly against the indiscriminate or even frequent use of bleeding in the cold stage of ague.

[Dr. Twining was a strong advocate of this method. "The benefit of bleeding," he says, "in the cold stage of intermittents is now so well known in India, that I need hardly say, that in a great number of cases it arrests the paroxysm, and is the best mode of preventing those ulterior visceral engorgements and indurations, which too often prolong the disease till the constitution is ruined. The patient should be bled in the recumbent posture, and permitted to lie quiet for an hour after the bleeding, and, during the paroxysm,

* [Morton's edition of Mackintosh's Practice of Physic. Phil., 1844.]

he should not be heated with too much bed-clothes, but may be allowed a blanket in the cold season, or a sheet in the hot weather; he should be supplied with a cup of warm tea, or gruel, or thin sago, soon after the blood has ceased to flow. By these means he will seldom have either a hot or sweating stage, and the majority of patients who have used a sufficient course of mild purgatives before the bleeding will not have a return of the paroxysm, provided they are tolerably well furnished with clothing, and not exposed to atmospherical vicissitudes."* In this country the practice has met with but little favour. Dr. Lee, the learned editor of Copland's Dictionary, states, that in former years he practised bleeding in the cold stage of intermittents to considerable extent, but in the form of the disease which occurs in the northern and middle states he found it unnecessary, and therefore abandoned it.† How far it is adapted to the congestive variety prevalent in the southern sections of the country, is yet to be ascertained. Dr. Bell in the Persian epidemic ague, before described, though previously prejudiced against bleeding in the cold stage of intermittent, employed it with advantage. Less than sixteen or twenty ounces he does not think sufficient. At first the blood came out only in drops or trickled in a feeble stream, dark, grumous, and coagulating on the arm.]

The late Dr. Kellie, of Leith, made a curious suggestion. From certain facts which are detailed in the *Medical Commentaries* for 1794, he thought himself warranted in concluding, 1. That, at any time during the cold fit of an intermittent, if tourniquets be so applied as to obstruct the circulation in two of the extremities, in three minutes thereafter the hot stage will be induced. 2. That if tourniquets be applied previous to the accession of the paroxysm, the cold stage will be entirely prevented. 3. That where the cold stage of an ague is either thus shortened, or altogether prevented, the following hot stage is rendered both milder and shorter in duration. The compression ought generally to be continued ten or fifteen minutes, for the symptoms of the hot stage will thus be moderated; but it ought seldom to be continued much longer, as Dr. Kellie observed that when this has been done, the pulse which had become fuller, stronger, and slower, became smaller and more frequent; and, when the tourniquets were removed, the rigors and successions returned.

2. On the approach and during the continuance of the *hot* stage, the clothing should be light, the room ventilated, and the surface of the body, or rather the arms and legs, frequently sponged with cold water. To allay the intense thirst, a plentiful supply of cold acidulous drinks should be allowed. Opium has been much recommended in this as well as in the cold stage. Dr. Lind, (*Diseases of Hot Climates,*) to whom the profession is chiefly indebted for the

* [Diseases of Bengal.] † [Dict. of Pract. Med., vol. i., p. 1093.]

knowledge of its specific action, was induced, after watching its beneficial effects when given at other periods of ague, to administer it to twelve patients in the hot stage, eleven of whom were immediately relieved from headache, the fever gradually abated, and a profuse sweat broke out; this alleviation of the symptoms was soon followed by a perfect intermission. He afterwards prescribed it with very beneficial results to upwards of 300 persons labouring under intermittent fever, the quantity usually administered being fifteen drops of laudanum combined with two drachms of the syrup of poppies.

There are certain cases in which blood-letting, or the application of leeches, is required in the hot stage, though much judgment is necessary before either is resorted to. Should severe local pain, or other symptoms supervene, pointing out the probability of organic lesion becoming established, abstraction of blood should not be omitted. It must not, however, be employed late in the disease to any great extent, otherwise the constitution will be impaired and the strength depressed—circumstances at all times to be dreaded in these fevers. Epispastics, as derivative applications under such circumstances, are only objectionable from occasionally increasing the irritation under which the patient labours.

3. When the hot stage has subsided into a free perspiration, the only thing to be done is to encourage the cutaneous discharge by tepid drinks until all uneasiness has subsided. As soon as this takes place, quiet means should be adopted to check it, for if it continue for any length of time, it tends much to weaken the patient; this is most judiciously effected by dry rubbing, and replacing the wet with dry clothing.

We have hitherto been considering the treatment of *simple* or uncomplicated intermittents, from the history of which Dr. Craigie has well observed, three points may be allowed to be safely established. 1. That some agues admit of spontaneous cure; 2. That if paroxysms are prevented from recurring, the disease is more likely to disappear than if they are allowed to recur; and, 3. That if permanent congestion or inflammation of organs is prevented from taking place, the disease is much more curable than when either ensues.

4. In the *inflammatory* forms, a more active plan of treatment is required. Blood-letting, when the patient is young and plethoric, and moderate purging, are generally necessary; and should local inflammations arise in the head, chest or abdomen, both general and local depletion, with such other measures as the circumstances of each case may indicate. Though the blood-letting may be performed with safety and advantage in the hot stage, when the violence of reaction is liable to increase the local inflammation, most practitioners advise that it should be deferred until the interval, unless the symptoms are such, that danger might be incurred by the

delay. In short, the same principles of treatment which experience has shown to be best suited to the local lesions that occur in continued fever, are applicable to those of intermittent, regard being had to the state of the vital powers, the type of the disease, and the intensity of the local affection.

The *gastric* complication, though seldom dangerous, is perhaps the most difficult to manage. It requires the occasional application of leeches to the region of the stomach or to the abdomen, followed by mild aperients, such as rhubarb and tartrate of potash, magnesia, or castor oil. If the stomach continue irritable, and the sickness and vomiting urgent, sinapisms should be applied to the epigastrium, and large draughts of thin barley-water, and afterwards the saline effervescing mixture, or soda-water administered. If necessary, the bowels may be relieved by occasional enemata. If the vomiting persist after these measures, opium, combined with aromatics, will generally allay it.

When ague is complicated with *dysenteric* symptoms, should the tormina and bloody or slimy stools resist the exhibition of opiates alternated with mild aperients, it will be proper, if the state of the pulse require it, to take blood from the arm, or to apply leeches to the abdomen, and afterwards warm fomentations, or the warm or vapour bath may be employed. A full dose of opium and James's powder may afterwards be given. Dr. Craigie recommends charcoal in doses of ten to twenty grains, five or six times a day if the stomach will bear it, as the most effectual remedy in agues with gastro-enteric disorder.

In the *malignant* forms of ague, twenty-five or thirty drops of laudanum should be given in hot-spiced negus at the beginning of the cold stage, and afterwards hot drinks to bring on reaction. In the hot stage, diaphoretics and antispasmodics are to be employed. The warm bath, or what has been found more serviceable, the vapour bath, should be employed; should the patient be too weak to undergo the fatigue of either, the hot air bath may be substituted. The sweating stage should be promoted by opium combined with antimony in warm negus, according to the state of the vital powers. The combination of camphor and ammonia is often very efficacious when there is great debility. When local complications arise in this form of ague, topical depletion, if the strength will bear it, or, if not, the application of blisters or sinapisms to the region of the part affected, must be resorted to, while the strength is supported by nourishment and cordials.

[In the congestive form vigorous practice is urgent. Maillot gives an example in which 40 grs. of the sulphate of quinine and 2 drachms of ether were given in 4 oz. of water at two doses, in the course of an hour; a starch opiate injection, with 60 grs. of the

sulphate of quinine and 2 drachms of ether, was ordered at the same time, with sinapisms to the legs and blisters to each thigh. Under this treatment the patient began to recover warmth in a few hours, and the heart to act more forcibly; but the next morning the amendment was so slight, that a sinapism was applied to the whole length of the spinal column, and a clyster with one drachm of sulphate of quinine, and three drachms of ether administered; reaction followed with recovery. Every effort must be made to produce speedy reaction. Stimulants should be freely given—brandy, ammonia, and particularly capsicum—both by the mouth and rectum; bottles of hot water, and hot bricks are to be applied to the extremities; sinapisms to the trunk and extremities, with turpentine fomentations to the chest and abdomen. As the pulse becomes developed, this active and violent treatment must yield to milder stimulants and diaphoretics. Quinine should be administered freely in large doses, by the stomach and in enemata, and it may also be rapidly introduced into the system through blistered surfaces, produced by the application of ammonia, and by inunction.]

5. During the intermission the most strenuous exertions to prevent the recurrence of the paroxysm are to be made. The treatment recommended as applicable to the paroxysm is essentially palliative, while that of the intermission is curative. Experience has very fully assured us of the specific effects of certain medicines; but we are totally ignorant of their modus operandi. The first thing necessary to be done, is to ascertain if there be co-existing organic disease, as such complications materially alter the means to be resorted to. In simple ague the bowels are to be thoroughly emptied; and as the secretions of the liver are generally deranged, four or six grains of calomel, followed by a purging draught, should be given, and repeated occasionally, until the alvine secretions and the state of the tongue give assurance of the desired effect being attained. In this country calomel is rarely administered as an antiperiodic; in India, however, according to Mr. Annesley, (*Sketches of Diseases of India*,) large doses, to the extent of twenty grains, are administered with the effect of almost immediately suspending the ague. We are not, however, inclined to rank it amongst the medicines proper to be administered as an antiperiodic; for, independently of its violent and weakening effects upon the system, it is almost invariably found, that, on withholding its administration, the disease returns. Where the ague is simple, or not materially complicated by organic lesion, after the primæ viæ have been well evacuated, those medicines which are so essential to the cure of agues, and are known by the name of antiperiodics, are to be administered. We shall now proceed to mention some of the more important:—

The exhibition of emetics is frequently of very signal service; administered about three hours before the expected period of

attack, it invariably mitigates, and sometimes entirely supersedes, the paroxysm. PRINGLE, however, says, that ipecacuanha alone is not adequate to produce this effect; and that it is necessary to combine with it one or two grains of the tartar emetic.

FOWLER's mineral solution (the Liquor Arsenicalis of the Pharmacopœia) has long been in estimation from its power of arresting this as well as other periodic diseases. In the fenny districts of England its specific effects are well known; it is there constantly used under the empirical name of *Tasteless Ague Drop.* This medicine, administered in doses of five or six drops, every four or five hours during the intermission, often puts a stop to ague. It may very frequently be employed, when quinine and other preparations of cinchona disagree. Dr. BROWN says, that an extensive experience leads him to give it a general preference over crude bark, but he thinks it inferior to quinine, though, under certain circumstances, it may supply its place; moreover, it may be given in a more inflammatory state of the system than is compatible with the safe administration of quinine. It has also been found that when an individual, who has been cured of ague by the sulphate of quinine, or any preparation of bark, suffers a relapse, the same medicine proves inadequate to restore him to health: under such circumstances arsenic will very generally effect the cure. [Arsenic has proved eminently successful in the treatment of intermittent in the hands of many physicians where bark and its preparations have failed. It has been recommended in the agues of children. The late Dr. DEWEES mentions the case of a child only six weeks old, who was affected with a severe tertian, which was cured by arsenic. A fluidrachm of FOWLER's solution was diluted with twelve fluidrachms of water, and six drops of this were given every four hours.* Professor T. D. MITCHELL, of Transylvania University, speaks highly of its efficacy in intermittent fever, and thinks that it may be safely and advantageously administered in doses of from fifteen to twenty drops three times a day. It is safer, however, not to commence with a larger dose than five drops twice a day, watching carefully the effects. Dr. PEREIRA says that it is not necessary to intermit its use during the febrile paroxysm, he having repeatedly seen it given with the best effects during the paroxysm. Dr. MACCULLOCH states that one-sixteenth of a grain of white arsenic, given three or four times a day, will cure intermittents when the *liquor potassæ arsenitis* fails.† Dr. BOUDIN, a medical officer of rank in the French army, who had opportunities of studying miasmatic diseases in France, Germany, Spain, Greece, and Algeria—employed arsenic to a great extent in the cure of marsh fevers, and has arrived at the conclusion that arsenious acid, properly prepared, preserves, in the microscopic dose of the hun-

* [Phil. Journ. of Med. and Phys. Sciences, No. xiv., p. 187.]
† [An Essay on Remittent and Intermittent Diseases.]

dredth of a grain, all its medicinal efficacy. He states, moreover, that he has often obtained, by a single dose of the hundredth of a grain of this medicine, the entire removal of fevers contracted in Algeria and Senegal, and which had previously resisted means of various kinds, including the sulphate of quinine, and change of climate. He believes that though the efficacy of both arsenic and quinine is subordinate to the reigning medical constitution, the former is to a much less extent, for nothing was more common than to find the arsenic successful in cases which resisted the quinine. Dr. Boudin thinks it of great consequence that the doses should be administered always five or six hours before an expected paroxysm. He abstains from giving the medicine on the days of apyrexia, as useless, and if, after two or three successive administrations, no effect is produced, he resorts to quinine. In old and obstinate intermittents it may be continued for a longer time. The preparation which he prefers is the arsenious acid.* Professor Dunglison states that he permanently cured several cases of quotidians and double quotidians by sulphate of quinine used simultaneously with arsenic, after they had resisted the former alone.†]

Sulphate of zinc has been administered by many practitioners with the most beneficial results. The usual dose is four or five grains in the form of a pill, every four or six hours. Sir James Macgrigor gave it to the soldiers in the Peninsula to the extent of half a drachm daily. Dr. Hendy, while residing at Barbadoes, employed the white oxide; and he states, that in doses from two to five grains, every six or eight hours, it removed agues which had resisted bark and other remedies.

The *Artemisia Absinthium* (salt of wormwood), in doses varying from one scruple to two drachms, has, according to M. Muys, been administered with very salutary results. It was given before the paroxysm, or immediately on its accession. From the experience which this practitioner had of the effects of this remedy, he concludes that it ought to be regarded as at least equal, if not superior, to bark.

The *acetate and citrate of ammonia* have also been employed, but with various success. Such has also been the result of trials of the salts of iron, and the whole range of bitter astringent woods. To enter upon a discussion of this class of medicines would be tedious and unprofitable. We shall therefore mention one only, the Peruvian bark, the effects of which upon intermittent fever have been marked by the most satisfactory results. As much of its efficacy appears to depend upon the quantity administered, it has always been an object to devise such means and such combinations as render it most grateful to the stomach. It may be administered in the forms of decoction, tincture, extract, or powder; the latter

* [Traité des Fièvres Intermittentes, &c. Paris, 1842.]
† [Medical Examiner, vol. vii., p. 28, and Practice of Medicine, vol. i., p. 434.]

appears generally to have been preferred in doses of from ten grains to two drachms. The mass thus swallowed, has, however, generally proved very embarrassing, not only from the quantity of woody indigestible fibre thus thrown into the stomach, but from its occasional nauseating effects. To the credit of modern science, these difficulties have been surmounted: in the sulphate of quinine we possess all that is curative in this remedy. This most elegant preparation is safe and powerful in its effects; administered to the extent of three to five grains every two, three, or four hours during the intermission, it rarely fails soon to arrest the progress of the fever. Some physicians have administered it to the extent of twenty grains at a dose, and have by this means succeeded in putting an immediate stop to the disease. In some persons quinine produces uneasy sensations in the stomach; this effect, however, is speedily counteracted by the addition of a few drops of tincture of opium. [The mode of administration of quinine, adopted by the late Dr. Eberle, and which he states to have invariably proved successful, was to allow the paroxysms to run on to the fifth or seventh day, when he found that a few doses of quinine put a permanent stop to their progress.* The writer prefers giving a large dose of quinine (from ten to twenty grains) within an hour of the expected paroxysm. He has rarely failed to arrest the paroxysm by this means. Where there is irritability of stomach, quinine will not be borne in these doses, and there are idiosyncrasies which but ill tolerate it at any time. In such cases no preparation which the writer has used has more pleased him than the cold infusion of the red bark (*Cinchona Rubra*) made by displacement.†]

The salt of the willow bark (*Salicine*) has lately attracted attention. In its effects it appears very nearly allied to the quinine, and though not equally efficacious, may yet be regarded as a very valuable substitute for it. [*Piperin*, obtained from the black and long pepper, has been recommended by the Italian physicians as little or not at all inferior to quinine, but increased experience does not seem to corroborate this statement. The antiperiodic power of the *Tela Araneæ* (the web of the common black cellar spider) has been vaunted by many. Dr. Robert Jackson considered it as superior to bark or arsenic in the cure of intermittents. Dr. Condie (*Watson's Practice*, 2d ed., p. 477) has found it to promptly suspend the paroxysms, as "effectually, certainly, as quinine; in a few cases, however, it failed." *Beeberine* is the latest substitute for quinine which has been proposed. It is the salt extracted from the *Noctandra Rodici*, and has been found by Dr. Logan‡ to

* [A Treatise on the Practice of Medicine. Philada., 1835.]

† [Red Bark ℥i; add sufficient water, acidulated with f℥i of dilute sulphuric acid, to displace f℥vj. Of this infusion as much may be given in the course of the day as the stomach will bear.]

‡ [Ed. Med. and Surg. Journ., April, 1845.]

possess antiperiodic properties of a high order, and to cost half as much as quinine. He records the experiences of Dr. Watt of Demerara, and Dr. Nicholson of Madras, both of whom have exhibited it in intermittent fevers of various intensities, and who concur in the statement that while it is as efficacious, it is free from the unpleasant consequences which supervene on the use of quinine. The *ferrocyanuret* of iron has been placed by Dr. Stokes after quinine and arsenic in efficacy for the cure of intermittent fever.]

In the inflammatory forms of ague, and when there exist acute local inflammations, blood-letting should always precede the exhibition of quinine or other remedies of this class; and as a general rule, the state of the internal organs should be carefully watched during the disease, that suitable measures may be adopted, as those local derangements materially interfere with the due effects of the medicines employed with the view of preventing the return of the fit. In all cases of protracted ague in which the intermissions are generally imperfect, it is probable that disease in some important organ, generally the liver or spleen, has taken place, which should either be removed or alleviated before the antiperiodic remedies are resorted to.

The treatment of the *sequelæ*, or effects of ague, is in general very unsatisfactory, as structural changes in the organs previously affected have generally taken place. Hence the practitioner has often to contend with enlargements of the liver and spleen, and the consequent dropsical effusion, or chronic diarrhœa, or dysentery.

In the consecutive hepatic disease, occasional local depletion, followed by blisters or setons, and mercurialization, and afterwards the mineral acids, may be cautiously tried. A course of the Cheltenham waters may be useful in recruiting the shattered constitution.

In cases of enlargement of the spleen, depletions and mercurials are useless, if not injurious. More benefit will be derived by a combination of quinine and sulphate of iron perseveringly employed. The hydriodate of potash in small doses has been recommended, but its utility is very doubtful.

The removal of the consecutive dropsical effusions must depend on the probability of the organic lesions on which they depend being curable: if they are not, we must attempt the palliative treatment by diuretics combined with mercurials.

We have already alluded to the treatment of agues complicated with diarrhœa and dysentery, to which we have nothing to add here. In all cases the convalescence, and especially the diet, should be carefully regulated. The importance of suitable clothing in such cases should not be overlooked.

CHAPTER VII.

REMITTENT FEVER.

[Syn.—*Remittens mitis, Febris biliosa, Synochus biliosus; Bilious Fever, Exacerbating Fever, Paroxysmal F., Sub-continual F., Endemic F., Endemial F. of authors; Fièvre remittente, F. bilieuse,* Fr.; *Galenfieber,* Germ.]

Few diseases have acquired so many different names as this form of fever. It has been called by the name of almost every country in which it occurs endemically: thus we have the *Mediterranean*, the *Walcheren*, the *Hungarian* fever, &c.; so that, without comparing the descriptions of these, we might be induced to believe, that instead of one form of disease, there existed many. This has led to so much confusion, that it often becomes a source of great difficulty clearly to understand the nature of the disease which the respective authors are describing. As it is obviously most unscientific to designate diseases from the localities where they occur, and is moreover very apt to mislead, we shall endeavour, under the term *Remittent Fever*, to give a succinct description of the various forms which this disease assumes, premising that it appears from the numerous accounts which have been published, to take on in different situations and in different seasons very dissimilar characters. These, however, may be referred to one of three forms. 1. The Simple; 2. The Inflammatory; and, 3. The Malignant.

Remittent fever may be defined to be a disease attended by distinct paroxysms of fever alternating with remissions, one paroxysm usually taking place every twenty-four hours; or it may be stated as a variety of continued fever, characterized by very evident and distinct exacerbations—in the one respect bearing affinity to intermittent, and in the other to continued fever. If we regard, however, its origin, its associations, and organic lesions, it is evidently more nearly allied to the former than to the latter. In many respects intermittent and remittent fevers present great general resemblances. They are evidently produced by the same causes, and have a tendency to assume the characters of each other; while the very marked differences in the accession, duration, and symptoms of the paroxysms, together with the very opposite nature of the intervening periods, evidently point them out not to be one and the same disease.

[Bilious remittent fever—a term first used by the late Dr. Rush, and now so generally employed to designate the variety of fever

under consideration—is, after intermittent, the most prevalent type in the middle, southern, and western districts of the United States, constituting their summer and autumnal epidemic, to which strangers, especially residents of the northern states, are so liable on their visiting these sections. From its annual presence in so large a portion of this country, and its frequent violence, its study is one of great interest to the American physician.]

I. SYMPTOMS.

Remittent Fever occasionally develops itself without premonitory signs; more usually, however, its attack is preceded by a few days' ailment, or by symptoms not greatly differing from those described as attendant on the forming stage of intermitting fever. The more usual symptoms which precede the attack, are, a general sensation of weight, followed by languor and lassitude of the whole system, sighing and yawning anxiety about the præcordia, with aching pains in the head, back, and extremities, [particularly the calves of the legs;] the face is pale, the countenance dejected, creeping sensations of cold are succeeded by flushes of heat, the appetite fails, the bowels are inactive, and the feces contain a large admixture of bile; the tongue is coated, the taste in the mouth is unpleasant, [bitter,] and metallic; the skin is sallow, the eyes become heavy, the brow clouded, and sleep disturbed by alarming dreams. [An indescribable uneasiness about the stomach is said by some writers to precede all the other symptoms.] According to Dr. Stevens, (*On the Blood*, p. 217,) there is a morbid action in the vascular system, the blood itself being diseased; which deranged state of the vital current is not the effect of either a local disease or a nervous impression, but is produced by the direct action of a specific poison on the living body, the consequences of which are, that the pulse is less frequent than in health, and the temperature of the blood, and of course of the whole body, is reduced sometimes so low as 94°. [The pulse, according to Dr. Bowling, is small, but the action of the heart is laboured, and the impulse and sounds are increased.] These premonitory signs increase in intensity until the attack of the disease is established; the symptoms of which are considerable aggravation in the pains of the back and extremities, at times to such an extent as to resemble those of acute rheumatism. [As the hot stage becomes developed, the pains in the back and loins frequently abate, and sometimes entirely subside; they may increase again, though in a limited degree, at the commencement of one or two of the next exacerbations.] After a general sensation of coldness, rarely amounting to a rigor, [and lasting from fifteen minutes to a couple of hours, during which there is usually excessive thirst, with nausea and vomiting before its termination, a recently eaten meal being gene-

rally rejected,] there comes on intense heat, together with tenderness of the epigastrium and right hypochondrium,* the surface of the body generally being above the usual standard and dry; the countenance is flushed and excited in its expression; the eye, slightly tinged, has a restless and wild expression; the head is distracted with throbbing pains, [which are generally in the forehead, but occasionally in the occipital region;] and in some cases there is wandering delirium, [which is most frequently associated with a drowsy stupor, being manifested when the patient is half awake, and passing off when he is completely roused;] the pulse is frequent, [generally during the first paroxysm rising to 120 or 125,] sometimes small and irregular, at other times full and forcible, but rarely hard or tense; the mouth and throat are dry and clammy; the tongue furred, white, and sometimes brown, [though it may remain moist and almost entirely natural;] the respiration is hurried, oppressed, and anxious; thirst is considerable, but not urgent;† for the most part there is nausea, which is often attended by watery or bilious vomiting; the bowels are generally torpid, but if acted on, the discharges are either black or green, and exceedingly offensive; the urine is scanty, [muddy,] and tinged with bile. These symptoms usually continue with varying intensity for some hours, ranging from five to ten, and closely represent the hot stage of a febrile paroxysm.

The febrile paroxysm is superseded by the breaking out of a gentle perspiration on the head and shoulders, which sometimes, though rarely, extends over the whole body, together with a general diminution of the heat and febrile symptoms. Nevertheless, there is by no means a state of apyrexia; there is yet much quickness and irritability about the pulse, with some slight elevation of temperature; and in place of the intense pain of head, sensations of giddiness, tinnitus aurium, lassitude, and tired feelings of the limbs. This state, which is termed the remission, continues usually for about two hours, rarely more than three, when the febrile symptoms recur, and gradually increase until they have acquired their former, or even a greater degree of intensity; and, after having continued for a certain period, generally more protracted than that of the first paroxysm, again subside into the remission. [In the subsequent exacerbations there is an aggravation of all of the symptoms of the initial paroxysm, except the chill, which is rarely well marked, when the form has been purely remittent from the beginning, though slight shivering often precedes the second or third, or even the fourth or fifth exacerbations. When there is a recurrence of the chills, Dr. Stewardson thinks that it is most commonly at the tertian period. On this point Dr. Boling says:

[Dr. Boling observes, that he has rarely observed moderate pressure to produce pain in the right hypochondriac region. The left hypochondriac region is painful on pressure when the spleen in enlarged.]

† [In this country the thirst is generally excessive from the very first paroxysm.]

"Where the fever is of the double tertian type, the first and third, perhaps the fifth exacerbation may be ushered in by tolerably distinct agues, while the second and fourth may be preceded by but the very slightest sensation of coldness, if any." The pulse in each succeeding paroxysm becomes more frequent; if it was very full or firm at the commencement these characters may slightly increase in the first few paroxysms, but in the majority of cases there is a gradual diminution in fullness, until convalescence begins. In the subsequent remissions a corresponding increase in frequency will be observed, and though relatively to the preceding exacerbation the pulse shall have fallen, it will still be quicker than during the former remission. "In the second exacerbation," says Dr. Bowling, "the moisture about the tongue is slight, though it is not, properly speaking, dry. In the third or fourth, it is apt to become dry, at least on the dorsum, though the edges remain moist; and still later, it becomes parched, rough, and cracked. With each succeeding exacerbation, also, as it becomes dryer, the colour becomes darker; from the natural colour or a dirty white, through all the intermediate shades, up to a dark brown, nearly black, receiving a modification in its tints, as has been before observed, from the matter ejected from the stomach. It also becomes intensely red at the edges, contracted and sharp pointed. During the remissions, the dryness and other marks of the exacerbations abate somewhat, and so much is this the case, that in the remissions following the earlier exacerbations, in which the tongue was dry, it becomes moist and nearly natural; and one not accustomed to the treatment of remittent fever, is surprised to find the tongue, that but an hour or two before was dry, parched and pointed, moist and relaxed, and the same in a short time again presenting the previous characters in an increased degree. In each remission there is a tendency in the tongue to assume a more natural appearance, but in each succeeding one this is less nearly approached than in the preceding; so that although, in any given remission, its appearance will have improved upon what it was during the exacerbation which preceded that remission, it will be worse than during any former remission. Of course, from the time that the case becomes decidedly benefited by medicine, although the exacerbations may not be immediately arrested, this increasing dryness, &c., of the tongue with each exacerbation ceases, or becomes less marked. In the first exacerbation of cases, not of a very severe character either, the tongue will sometimes be found dry, parched and fissured on the dorsum, although it may become less so, or even quite moist in the next exacerbation. In these instances, the first exacerbation has probably supervened soon after the stomach had been loaded with indigestible food, which fortunately is generally rejected before the next exacerbation. There is this difference between the appearance of the tongue to which I have just alluded, and that which becomes dry gradually in the progress of

the case: the former retains its natural size and shape, while the latter, as already observed, becomes narrow, sharp, and contracted."* The salivary secretion, often diminished or even suspended during the exacerbations, becomes free during the remissions, but less and less so with each succeeding one. The disgust for food from the commencement is usually extreme, but is said by Dr. Bowling to be much less marked in negroes than in whites. The thirst is excessive throughout the disease, there being a constant craving for cold or acidulated drinks. In the first remission this sometimes abates, but in the subsequent ones is as urgent as during the exacerbations. Distressing and constant irritability of stomach is a prominent symptom, increasing with each paroxysm. The matter vomited is bile, which at first is yellowish or greenish, "and at length becomes of a dark grass green, and small in quantity, most frequently only sufficient to give a bluish-green tinge to a glass of water that may have been retained longer than usual. In severe cases, bilious matter, at least in any considerable quantity, soon ceases to be thrown up, and the matter ejected, independent of medicines, and such fluids as may have been recently swallowed, is composed of a tough, glairy fluid, the most tenacious part of which, containing suspended in it small, dark, bluish-green flocculi —at other times a greenish-brown, dirty-looking sediment—subsides and adheres to the bottom of the vessel. As the disease advances, although the efforts to vomit become more incessant, the matter vomited diminishes in quantity, so that frequently, in hours of straining and retching, nothing is thrown up but the fluids, &c., recently swallowed."

Stewardson, Ferett, Dickson, and authors generally, represent the bowels as costive, but Dr. Boling thinks that in the cases he has met with there is a decided tendency to diarrhœa, and that purgatives should be cautiously administered after the first two or three paroxysms. After the operation of the first purgative but little fecal matter is observed in the evacuations, they being chiefly serous, containing bile of yellow or greenish colour, though sometimes they are clear and transparent. Lumbrici are frequently discharged from the bowels, particularly in children. Delirium rarely occurs during the earlier paroxysms, and when it does it is mild and temporary. When it is established later in the disease it may persist during the remissions, though usually abating. It is rarely violent. The mind seems occupied with the ordinary associations of the patient. Chisholm says:—"A man much involved in debt is incessantly arranging with his creditors. A soldier talks of the duty he has to perform, and ever and anon expresses his fears of the officer's displeasure. A sailor in like manner is engaged in

* [Observations on Remittent Fever as it occurs in the Southern parts of Alabama. By Wm. M. Boling, M. D., of Montgomery, Alabama. (*Am. Journ. Med. Sciences*, April, 1846.) This is an excellent paper on the symptoms of remittent fever.]

maritime affairs."* The perspirations during the remissions are less and less marked as the disease advances. The skin assumes frequently, at an advanced stage of the disease, a yellowish tint, which is most frequently first noticed in the conjunctiva. Sudamina are met with in protracted cases; no eruption has ever been observed in this type of fever, though genuine petechiæ occur in the malignant forms.

"The *sensation* of debility is extreme, and is frequently as much complained of in the first or second exacerbation as later in the disease, when the *actual debility* is much greater. At a time when a patient will make complaints of the greatest debility, let it become necessary for him to get up, or assist himself in any way, and he will do so without any call for aid; or if he does demand it, will show himself at the same time capable of considerable muscular exertion. It is only in very protracted cases—and few such occur in this part of the country—that the patient requires much assistance in performing any necessary movements, provided he is sufficiently sensible to be aware of what is necessary."†]

In this way the disease proceeds through a regular succession of febrile paroxysms, or rather exacerbations and remissions, until a critical discharge, which most commonly is a profuse perspiration, takes place. This is the commencement of convalescence.

According to Dr. Jackson, a favourable termination of this nature is frequently noticed to occur on every seventh day. He has almost invariably observed that the critical perspiration has supervened on the seventh, fourteenth, twenty-first, or twenty-eighth day.

Should this series of events not take place, however, the fever becomes more uniform in its course, and assumes a character which is fraught with much danger. When this is the case, it is not unfrequent that, after the second paroxysm, the phenomena of the disease become more obscure, and terminate in remissions which are much shortened in duration, and attended by a more marked febrile character than was the case on the first or second remissions—the exacerbation of the fever itself being in every respect more intense and greatly aggravated, in many respects partaking of the symptoms observable in extreme cases of typhus. The surface of the skin assumes a yellow hue, and maintains an excessive temperature, feels dry and harsh, and occasionally covered by a clammy sweat, especially towards the head and shoulders, but which by no means gives relief to the urgency of the symptoms. The countenance is flushed and swollen; the eyes are prominent, glistening, and wild; the whole expression is one of extreme anxiety and distress. The headache is intense; there is frequently delirium, and occasionally in the paroxysms of pain the patient emits piercing

* [Manual of the Climates and Diseases of Tropical Climates.]
† [Boling, loc. cit.]

shrieks. The pulse is very varying, now it is full and bounding, at one time small and feeble, at another quick and sharp. The tongue becomes covered with a yellow viscid mucus; the bowels are tender to the touch, and distended by flatus; the stools are fetid, sometimes passed unconsciously; [the nausea is distressing, and the vomiting incessant, there being scarcely any interval between the spells;] there is retention of urine, and constant restlessness with watching. As the disease progresses, the state of excitement subsides into stupor and insensibility; the tongue becomes coated with a thick, black, dry fur; the pulse fluttering; the respiration heaving and laborious, with subsultus tendinum; and the patient gradually sinks into a complete and ultimately fatal coma.

Such is the general view of the *simple* remittent fever as it occurs in temperate climates. The exacerbations in their periodical recurrence usually assume a double tertian or quotidian type; the former is stated to be the most frequent; for notwithstanding the exacerbations occur every day, yet it is very evident that they are more severe in their character on the alternate days. Whatever be the type of the remittent, the remission almost invariably occurs towards morning; while, in double tertian, the exacerbation takes place towards noon, and in the quotidian type some hours earlier, usually about nine or ten o'clock. [Dr. Boling says, that "at whatever period of the day the first exacerbation may occur, there is a tendency in the subsequent ones to manifest themselves in the after part of the day, say some time between noon and six o'clock in the evening, and so strong is this tendency that in most of the cases in which the exacerbations anticipate, the first will be found to have occurred after this period, and in nearly all in which any of the early exacerbations are deferred or protracted, the first will be found to have occurred before this period. In fevers of the double tertian type, however, the exacerbations will, in a large majority of cases, be found to occur alternately in the fore and after part of the day." Dr. Swett found the exacerbations to come on generally about four o'clock in the afternoon and continue during the night, during which time the pulse would rise to 112 or 116, while in the morning it would be found from 96 to 100.] Unless the disease is disposed to terminate favourably, the alternating of the period of remission with the exacerbation is rarely perceptible after the twelfth day. The remissions, to say the least of them, are very obscure. The patient exhibits a continued state of lethargic drowsiness, attended by a torpid condition of the whole body; the bowels refuse to act unless by the aid of powerful medicines, the stools being of a most unhealthy black nature; aphthous ulcerations of the mouth and fauces take place, a state of things which is quickly followed by the typhoid stage of remittent already described. [Dr. Dickson observes, that "it is not uncommon, especially among the most perfectly acclimated adult natives

resident in malarious localities, and strangers long familiarized with our atmosphere, to find bilious remittent lengthening itself out to a tedious protraction; the patient sinking after the tenth or twelfth day, into a low state of fever, resembling the less severe grades of typhus, and hence obtaining among us the designation of the typhoid stage of bilious fever. Here the well-marked lines which separate the period of exacerbation and remission are almost effaced; the characteristic periodicity almost obliterated, the fever degenerates nearly into the continued type; and the patient, in the language of the older practitioners, "wades through" the attack with no definitively regular changes observable from time to time, until by the success or failure of our efforts in his behalf, he recovers or is lost."* Dr. Swett found the remissions in many cases by no means decided, and in some not more so than in continued fever, the two classes of patients being carefully compared at the same time; "so that the physician who should attempt to find his diagnosis of the two diseases in the character of the remissions only, would not unfrequently find himself without a sure guide."†]

Sometimes remittent fever makes its first appearance under the form of a regular tertian ague, and is so little distinguishable from it, that doubt may be entertained as to its nature, until after two or three paroxysms are passed over, when the symptoms together with the order of their recurrence, sufficiently develop its true character. In fact it is doubtful whether it may not really be originally a true tertian ague, converted under the peculiar circumstances into remittent fever.

II. VARIETIES.

The simple form of remittent fever is subject to many variations, according to age, constitution and locality; but as these almost invariably, quickly pass into and assume all the characters of the inflammatory or malignant types of the remittent disease, and of which we shall presently treat, we shall not further allude to them.

One variety, however, which occurs to strangers entering a country where remittent fever is endemical, and which Dr. Copland terms the *bilio-inflammatory remittent*, must be noticed here. Pringle (*Diseases of the Army*), when speaking of the diseases which occurred in the cantonments in Dutch Brabant, gives a very full description of this as it occurred there.—The patients were suddenly attacked by ardent fever accompanied with the most intense headache, and generally with delirium. Should this not take place, and they continued sensible, the patients complained of severe pain in the back and loins, intense thirst, burning heat and oppres-

* [Dickson's Practice of Physic, vol. i., p. 290.]
† [Am. Journ. Med. Sciences, Jan., 1845.]

sion about the præcordia, nausea, and occasionally, in some cases, severe retchings and vomitings of bile; while in others the bile was discharged by stool, or accompanied by tenesmus and pains in the abdomen. The pulse is described by Mr. Lander to be at first small and not quicker than natural, but to rise after bleeding: this alteration in the pulse Dr. Craigie attributes, however, to the natural course of the disease. This form of the fever generally remitted from the beginning, upon bleeding and free evacuation of the bowels; but if these measures were omitted, it was apt to take on the continued form, and to assume the typhoid character. In some cases, however, though they were speedily and freely bled, yet in an hour after, so great was the cerebral excitement that high delirium ensued; and, after continuing for some hours, subsided on the coming on of a profuse sweat, under which all the other symptoms either abated or vanished. Next day, about the same time, the paroxysm returned, and in six or seven hours ran the same course. In some, the paroxysms were less distinct, the hot fits longer, followed by imperfect sweats, which afforded but slight relief. Sometimes, indeed, the remissions were so imperceptible, that the fever appeared almost continued in its character, while the nearer it approached this last state, the more intractable it became. But when the paroxysms were distinct, with a remission of some hours between them, the patients for the most part did well, however great had been the cerebral excitement during the exacerbation. After the accession of a few paroxysms the strength of the strongest men was so reduced, that they were scarcely able to stand. In those who had been ill about three weeks, and without any well-marked remission, the fever ended occasionally in quotidian paroxysms; but in these cases there were usually gentle sweats, or rather a continued moisture on the skin. In some cases the critical sweats, which generally occurred about the ninth day, were profuse and very offensive, after which the disease took on the form of a regular intermittent. In others, the crisis took place by stool, or by an abundant flow of urine.

Dr. Stedman and Mr. Lander mention as a characteristic of this form of remittent fever, that the delirium was attended by attempts at self-destruction. That some became delirious without any previous complaint, and would have thrown themselves out of the window, or into the water, if not restrained. This frenzy continued for some hours, when falling into profound sleep, they awoke quite sensible but with violent headache. Drs. Brown (*Cyc. of Prac. Med.*), and Jackson (*Sketch of Febrile Diseases*), have paid particular attention to this symptom. The former says, that, instead of the ordinary form of the febrile delirium, in which the mind appears occupied by a crowd of unconnected ideas, and quite abstracted from surrounding objects, it in this case retains all its acuteness of perception and vigour of reasoning; but there is one erroneous impression so firmly fixed, that no argument can shake

it, and that it is frequently of so gloomy a cast, as to impel its victim almost irresistibly to suicide. In cases where it occurs, the intellect is by no means obscured; on the contrary, it is often accompanied by an elevation of the mental faculties: nor is it symptomatic of any peculiar bad state of the system, nor is it proper to the advanced stages of remittent fever; on the contrary, it is more frequently observed at the very commencement of the disease, when the faculties, both mental and bodily, are as yet but little affected. It is generally observed in those whose minds have been disciplined by education, and have accustomed themselves to the exercise of its faculties: it may therefore be regarded as a morbid exaltation of them, depending on the general excitement to which the system is subjected during the febrile exacerbation. Dr. Brown says that no decided peculiarity has been detected in the symptoms during life, or in the structural changes discoverable after death, to explain the striking discrepancy from the ordinary form of delirium which occurs in these cases. In all of them there has been evident derangement of the digestive canal and its subsidiary viscera; and this derangement, in general so apt to produce mental despondency, is acting on a sensorium enfeebled and irritated by fever: but the same circumstances exist in other cases, in which there is either no aberration of mind, or in which, if it exists, it assumes the ordinary febrile form. We are therefore compelled to suppose, that some peculiarity of individual constitution co-operates with the disease in engendering this unusual form of delirium; but there is considerable difficulty in discovering in what this individual peculiarity consists. A tendency to actual insanity certainly will not explain it, for delirium has borne this appearance in individuals who have at no other period of their lives manifested any indications of that malady, and the mental illusions always cease on the subsidence of the fever.

The *inflammatory* form of remittent fever in many respects resembles the simple, excepting that there is a general aggravation of the symptoms, especially of those connected with the circulation. This form occasionally shows itself without any previous warning. Sometimes the premonitory symptoms are ushered in by a sudden attack of the most excruciating headache, which, after it subsides, leaves the system weak and overwhelmed with lassitude: in other cases they are much the same as is observed previous to the attack of ordinary fever, viz., pains in the loins, alternate chills and flushings of the surface, &c.

In general the violence of the disease is in proportion to the suddenness and violence of the incursion. (Eberle, *Practice of Physic.*) When the attack comes on gradually, preceded by the usual premonitory symptoms, the disease generally runs its course slowly. When, on the contrary, the invasion is sudden and violent in its progress, we may expect the disease to be rapid and violent in its

course. In the milder forms of the inflammatory variety the first paroxysm generally is ushered in by a very distinct cold stage, which never takes place on the succeeding exacerbations. This sensation of chilliness, for it does not amount to a rigor, is succeeded by headache of the most violent character, flushed face, suffused, and wild expression of the eyes. The skin is generally burning, the thirst intense, with loss of appetite, nausea, and strong, full, and quick pulse. After a few paroxysms of this kind, a copious discharge may take place, either by perspiration or by the bowels, which proves critical, and convalescence ensues.

The inflammatory remittents generally, however, present a much more severe and dangerous character, and which they assume, under circumstances favourable to their development, from the very commencement of the attack. When it assumes this severer character, the cold stage is short and by no means severe, it being almost immediately superseded by the febrile accession, which rapidly acquires a great degree of intensity. It is marked by an incessant and most uneasy restlessness, acute throbbing pain of the head, giddiness, excruciating pains in the loins and inferior extremities, short hurried breathing, with feelings of the utmost anxiety. The face is deeply flushed; the eyes suffused, and of a dull expression; there is sensation of epigastric fullness, weight, and sickness; the appetite is lost; the tongue furred; the bowels constricted; and the urine scanty, high-coloured, and offensive. These symptoms continue with varying intensity for nearly twenty-four hours, when a remission, always very marked, and frequently amounting to a perfect intermission, takes place. This cessation, however, is very deceitful; for, after a very short period, the second paroxysm is ushered in with aggravated severity. The restlessness is much increased, sleep cannot be procured; the surface of the skin is more intensely hot and pungent to the feel, acquiring that peculiar character which has been called *calor mordax;* the pain of the head is most acute, with feeling of constriction, especially over the orbits; the temporal arteries throb violently; the conjunctiva is yellow, and suffused with blood; the eyes are watery and intolerant of light; the pulse is quick and vibrating; the epigastrium oppressed, and more painful on pressure; the thirst is excessive; and the sickness most deadly, the patient being much harassed by the nausea and retchings which are constant; the bowels remain torpid.

Very often, however, a different state of things obtains after the second paroxysm. The symptoms give way to a clammy perspiration, which is succeeded by an exacerbation, which appears to be very much less violent. On this, the third day of the fever, the patient is less restless, nor does he complain so much of thirst, pain, or heat; but the skin is generally dry, though sometimes it is covered by a clammy perspiration; the face is slightly yellow, with transient flushes passing over it, which, instead of being of

the bright red colour they were during the preceding exacerbation, have rather a dull livid hue, and the pulse is less tense and softer, but still frequent. Dr. Stevens says, that if blood be abstracted the structure of the red globules will be found to be deranged, as is evident from the colouring matter being often detached from them and dissolved in the serum, imparting to this principle of the blood, when it separates from the fibrin, a bright scarlet colour, the colouring matter being so completely dissolved in the serum that it cannot be separated, either by filtration or any other mechanical means. The tongue is covered with a thick tenacious yellowish fur; the taste is either impaired or so depraved that everything seems bitter. This state is viewed by Irvine (*Observations on Diseases of Sicily*) as representing the intermission of a double tertian. Though it is often critical, the symptoms afterwards assuming a more favourable character, yet it must not lull into security, as this apparent cessation of severity in the febrile accession is often only temporary; for, in severe forms of this variety of the disease, it not unfrequently happens, after this appearance of complete remission, that towards evening an end is put to all anticipation that the disease has subsided, by an exacerbation taking place, in which all the dangerous symptoms are greatly increased. So deceitful, however, is this period, that not infrequently it has been mistaken for a complete intermission, and tonics and stimulants, which have been given with the view of preventing the recurrence of the paroxysm, have but tended to increase the severity of the disease.

Burnett (*On Mediterranean Fever*) has particularly described the succeeding stages of this variety of remittent fever when it assumes an aggravated form. They are marked by a great increase of uneasiness and pain about the epigastric region, especially on pressure, some patients complaining of a burning sensation extending upwards to the throat; there is great restlessness, with oppression about the præcordia; the abdomen is likewise painful, tense, and tympanitic; the pain of the head becomes more intense, attended by wandering or inattention to surrounding objects; occasionally delirium ensues, which, as the disease advances, passes into coma, though the intellect is often to a certain extent retained, so that, on being roused, the patient answers questions rationally, though, if not disturbed, he lies in a semi-stupid listless state. The countenance becomes deeper and more dingy in colour, till it is almost brassy and orange-like; the eye dull and watery, and the conjunctiva of a confirmed yellow; the skin harsh, moist, and clammy, exhaling a disagreeable fœtor, and at first of a bright yellow, but afterwards of a darker hue; the pulse is irregular, sometimes full and tumultuous, at other times it is quiet, small, but generally intermitting; there is incessant vomiting, often of blood, succeeded in some cases by a matter resembling coffee-grounds; the stools are frequent, thin, black, fetid, and sometimes glutinous-

like; and, according to Dr. Craigie, if kept, undergo the putrefactive decomposition natural to animal matters. As the disease advances in its progress, the remissions are scarcely perceptible, certainly by no means so commonly distinct as Cleghorn (*Diseases of Minorca*) states them to be. The whole character of the disease rather partakes of that of a continued fever: blood exudes from the gums and fauces, and hemorrhage to a considerable extent takes place from the nose and bowels; the restlessness is increased; the jactitation in the bed being constant, subsultus tendinum with picking of the bed-clothes ensues; an irksome pain is felt across the pubis, and there is a suppression of urine. In many cases there is complete ischuria renalis, and in some the bladder has been found distended, so as to require the introduction of the catheter; the stools are passed involuntarily; occasionally the parotids inflame and suppurate; petechiæ and vibices occasionally make their appearance; the tongue becomes coated with a black crust; the teeth covered with sordes; the breathing more laborious, the action of the respiratory muscles being very violent; the anxiety extreme; the pulse intermitting, and so weak as to be sometimes scarcely perceptible; and the whole is finally wound up by cold extremities and profuse clammy sweats. Death frequently ensues on the fourth or fifth day, more generally on the sixth, seventh, or eighth, though occasionally life may be protracted beyond that period.

Such are the symptoms which mark the progress of the inflammatory remittent in its more formidable character, or when it has been neglected or ill-treated. It also frequently supervenes on those slighter forms which have been previously described; so that it is always necessary for the practitioner to be on his guard, as the approach of the severer type is often masked and very insidious, and the symptoms often becoming violent and unmanageable, when least expected to be so.

The *malignant* form of remittent fever is usually preceded by peculiar feelings of feebleness and languor, with pains in the loins and head, giddiness, with flushes of heat, alternating with sensations of chilliness, which terminate, not in a shivering fit, but in a general collapse of the vital powers, and an alarming depression of the circulating system. This is quickly followed by a period of reaction, characterized by the most excruciating pain over the eyebrows, and in the head generally, with a peculiar feeling of tightness, as if the skull was firmly girt with a cord; the skin is dry, hot, and harsh; the countenance flushed and of a purple hue, has rather a collapsed and harassed aspect, expressive of pain and anguish; the eyes are injected and ferrety; the tongue is clammy, and coated with a whitish yellow fur, sometimes rough, dry, and brown; the pain of the epigastric region severe, with occasional bilious vomiting; the pulse full and frequent, but is neither hard

nor vibrating; and the patient feels oppressed, restless, and desponding. This state continues for about twelve hours, when a remission ensues, though the patient yet remains very ill and uncomfortable. After five or six hours a slight sensation of cold ushers in another paroxysm, in which the symptoms evidently assume a more dangerous character; the headache is most excruciatingly severe, attended by transient delirium, and uncontrollable restlessness and jactitation; the collapsed and anxious expression of countenance is more marked; the pain at the pit of the stomach is burning and urgent, and much increased on pressure; the whole abdomen participates in this painful tenderness; the general expression of the eyes is glassy and sunken, and the conjunctiva is both yellow and suffused with blood; the skin is of a dusky yellow, and its temperature unequal in different parts; in some, as in the præcordial region, head, &c., being intensely hot, while in others it is cold and clammy, while its sensibility is so much diminished that blisters only produce reddening of its surface; the breathing is short, laborious, and hurried; the tongue is coated with a dry yellow or brown crust; the lips and teeth become thickly covered with sordes; the thirst very intense; there is nausea, with frequent vomiting of matter resembling curds and whey, which is likewise the character of the copious and frequent stools. Another remission ensues like the former, attended by manifest general indisposition and debility, and followed by another exacerbation of the symptoms, in which the collapse of the arterial system is more marked. The disease now assumes a continued form, and in which, as it progresses, the symptoms evince a more dangerous character: the restlessness is unceasing; the headache becomes of a low nervous character; the abdomen tumid and painful on pressure; the solids appear to have lost their tone, and feel generally flaccid; the skin is of a dirty yellow colour, and, as death approaches, acquires a greenish hue, and in place of the usual temperature, is cold, and covered with a clammy exudation, which is particularly fetid and offensive; the vascular reaction is very low and imperfect; the pulse is intermitting, small, rapid, and fluttering; the tongue is dry, and covered with a black fuliginous coat; the teeth and lips are thickly incrusted with a viscid slime; the gums are spongy, a bloody sanies exuding from their surface; aphthous spots appear in the mouth and throat; the evacuations, which in appearance are black and pitchy, are dark and offensive; there is constant vomiting of a dark grumous fluid; the secretion of urine is suppressed, or nearly so; delirium, occasionally violent, but for the most part of a low muttering kind takes place, and is the forerunner of coma which almost invariably ensues, while the whole frame is shaken by subsultus tendinum; vibices and petechiæ make their appearance; and the morbid state of the fluid is further shown in the bloody discharges which take place from the mucous surfaces of the mouth,

nose, and intestinal canal. The patient gradually sinks, unless convulsion, as is not unfrequently the case, puts a sudden termination to the scene.

Dr. Clark (*On Diseases of long Voyages to Hot Climates*) describes a variety of this form, which in some respects is yet more malignant in its characters. It is ushered in by slight shivering, headache, pain and sickness of the stomach, with great præcordial anxiety and an overwhelming depression of spirits. Sometimes without any notice the patient faints, during which the expression of the countenance is pale and gloomy in the extreme, a character that is somewhat retained after the state of syncope is recovered from, immediately after which a large quantity of bile is vomited. This period of the disease is particularly marked by nervous timidity, which continues during the paroxysm; the pulse is small, feeble and quiet; and the pain of the stomach and vomiting increase, until the paroxysm has fairly set in; the countenance is flushed and anxious; the eyes are red, and the headache violent; the pulse rises, becomes full and sharp; the mouth is dry; the tongue furred; and the thirst intense; uncontrollable delirium ensues, which subsides on a perspiration breaking out. In the remission which follows, the pulse becomes slower and soft, but the nervous feelings of debility and personal danger remain. This remission continues but for a short time, when another paroxysm ensues, attended by aggravation of all the symptoms: the fever now becomes continued, no trace of intermission being discoverable; the pulse intermits, is small and rapid; the tongue becomes black and crusted; the epigastric pains are excessive; the stools frequent, fluid, and offensive, and voided involuntarily; coma alternates with violent delirium. Tremors, hiccough, vibices, and petechiæ, are prominent symptoms, together with a clammy moisture in the skin, from which exudes a stinking cadaverous smell. After the third or fourth day the patient dies.

In this variety there is, from the first, a strong impression on the patient's mind that the disease will terminate fatally, and this is so firm, that no reasoning can alter it. Dr. Brown (*Cyc. Prac. Med.*) says, he does not know whether this is to be considered as a mental illusion or not, for, in every case which had fallen under his observation, the patient's prediction had been fulfilled. It is doubtful, whether the mental impression was instrumental in the accomplishment, or whether it did not itself proceed from some deadly feeling of the patient, which language could not express, and of which the cause did not display itself by manifest signs. Dissection has thrown no light upon this point.

Such may be considered the more usual forms in which remittent fever is met with, when uncomplicated by other diseases. There are, certainly, many varieties which occur; but to enter at any length upon them, would occupy more space than our limits will permit.

[A variety of pernicious remittent, is occasionally met with in our southern states, which may be called the *comatose* form, and which resembles closely the same variety of pernicious intermittent already described. The force of the malarious poison seems in such cases to be expended on the great nervous centres. Commencing with slight shivering, the vascular reaction soon becomes intense; the face is full, and flushed; the pulse firm and full, there is strong pulsation in the larger arteries, especially the carotids; deep stupor soon comes on, with dilated pupils, and slow and often stertorous breathing. As the paroxysm abates the stupor subsides, and during the remission, which generally lasts but for a few hours, no alarming symptom is present. On the return of the paroxysm, which frequently anticipates itself, the same train of symptoms appear with increased severity. And this is repeated until recovery or death occurs. The remissions are sometimes very imperfect, and Dr. Boling relates a case of this kind where the patient lay eight days comatose. When called to him, he says, "he presented all the symptoms of apoplexy, and nothing revealed the true nature of the case but a disposition to yawn and stretch every morning, continuing from 7 A. M. to 10 A. M., and a slight abatement in the force, and a diminution of a few beats in the frequency of the pulse, with a temporary disappearance of the stertor. During the remissions, while yawning and stretching, his appearance was exactly that of a person just on the point of awaking from a sound and refreshing sleep, and the bystanders, even those who had seen him several times, could scarcely divest themselves of the impression that this was the case, and were in momentary expectation of seeing him open his eyes and address them. The case terminated favourably, the patent waking up during the hour of remission on the 9th morning, and required but little treatment after."

A form of remittent fever called *congestive*,—and styled by Dr. Dickson, "a hideous and pestilential modification,"—prevails to a great extent over a large portion of our northern and north-western states, and is frequently terribly destructive. It commences often as a common intermittent, and the first paroxysm frequently attracts but little attention. After an interval of variable length, another rigor occurs, which may be prolonged for several hours, until reaction or death takes place. This is remarkable for the extreme coldness and death-like hue of the face and extremities. There is violent gastro-intestinal irritation, with incessant purging and vomiting. The discharges are often mixed with blood, and rarely with bile. Dr. Parry, of Indiana, says that they have "the appearance of water, in which a large portion of recently killed beef has been washed."* There is but slight abdominal tender-

* [Am. Med. Journ., July 1843. This is an admirably written paper on the Congestive Fever of Central Indiana, by Dr. Charles Parry, of Indianapolis.]

ness, but a sense of weight, and burning heat in the stomach are complained of. The thirst is intense, and unquenchable. The respiration is peculiar; it is described as consisting of "a deep drawn double inspiration (or double sigh), with one expiration;" the patient complains that he cannot get his breath. The pulse is small, thready, and frequent, beating from 120 to 140 in a minute; it sometimes becomes imperceptible for several hours before death, though generally, it is to be felt to the last. The body is bathed in a cold, clammy sweat, occasionally limited to the face and neck —the skin being of a livid hue and shriveled. There is usually excessive restlessness, the patient continually tossing about, and endeavouring to get out of bed. In many instances the brain is undisturbed, the intelligence remaining until death. In some cases there is severe cephalalgia and even delirium; and in others coma makes its appearance early in the second paroxysm. If no abatement in these symptoms occurs, death takes place in from twenty-four to sixty hours, the patient expiring in great agony. If, however, the remedies have acted, the restlessness diminishes, the skin dries, the pulse falls and becomes developed, and the body gradually attains its natural temperature. Dr. Wharton, of Mississippi, observes that "this is a very slow process, as it often requires from twenty-four to forty-eight hours for the heat to travel from the knees to the extremities of the toes."* Dr. Boling asserts that "notwithstanding the small and thready state of the pulse, in this variety of pernicious fever especially, the action of the heart will be found strong, as indicated by the loudness of its sounds, and the force of its impulse."†]

III. COMPLICATIONS.

It is necessary to keep in view the great liability of this disease to become complicated with organic lesion. This is almost universally the case in the inflammatory and malignant forms. The symptoms which have been detailed as characterizing these, show evidently that there is always present much functional disorder of the liver, alimentary canal, and brain; and we find it is in these organs that lesions are most ordinarily met with. As the occurrence of these is one of the chief causes of fatal termination, the importance of being aware of their presence is obvious. At the same time it must be understood, that in describing them we are not alluding to that condition of remittence which so often occurs in acute and febrile diseases. The copious details of the different forms of remitting fever which have been given, render a lengthened detail of its complications unnecessary.

* [The Congestive Fever of Mississippi, with cases. By R. G. Wharton, M. D., Grand Gulf, and Am. Journ. Med. Sci., April 1844.]

† [Boling, loc. cit., p. 109.]

When the mucous surface of the stomach becomes inflamed, independently of the usual heat, pain, and tenderness, being much aggravated, there is a constant craving pain, increased on pressure, and which is continued during the remission. The tongue is covered with a thick yellowish layer of mucus, subsequently becoming brown and cracked, with dry fiery edges. There is general loss of appetite, or rather a disgust of every kind of food. If the alimentary canal participates in the inflammation, and which it usually does, the abdomen generally is painful, distended, and tympanitic; the stools are watery, and resemble in appearance the washings of flesh; the urine is turbid and yellow. The dysenteric symptoms which show themselves so often in the advanced cases, may be referred to this cause.

When the structure of the liver participates in the mischief, there is severe pain and tenderness of the right hypochondrium, with a pulsation there and on the epigastrium, which Mr. Cartwright describes as equal to that which the heart produces in the thorax, and synchronous with the pulsations of that organ. There is also excessive irritability and spasm of the stomach; the febrile heat is intense; at first the tongue is clean, but afterwards it becomes coated with a brown fur; there is great torpor of the bowels, incessant sickness and vomiting, at first of a very small quantity of glairy fluid, without admixture of bile, but subsequently of a dark grumous fluid, which is likewise the character of the frequent copious motions which supervene on the previous state of costiveness.

When the brain or its membranes are affected, the excitement during the exacerbation is characterized by delirium, which alternates and eventually passes into coma. The fever under these circumstances soon takes on an adynamic character, and a general depression of the vital functions early terminates in death.

M. Baumes also describes remittent fever when complicated with pectoral disease. This, however, is comparatively rare. When, however, it does occur, the pleural or bronchitic inflammation immediately shows itself by the symptoms usually attendant on these conditions. [Bronchitis is a very common complication of the remittent fever of this country. Pneumonia is rarely met with.]

IV. TERMINATIONS.

Remittent fever in all its varieties may terminate in perfect recovery, or be converted into intermittent disease, or superseded by other affections. It may terminate in death by syncope, convulsion or exhaustion. Death may ensue either in the first paroxysm, in the third, or in any day of the fever subsequent to these. If it occur in the first paroxysm, it is usually accompanied by delirium, which subsides into a fatal coma; but if it occur in or after the

third paroxysm, it usually takes place by fainting or by convulsion, which are attributable to inflammation of the brain; or it may ensue from the weakening effects of the excessive discharges both alvine and cutaneous, or from the abdominal lesions generally, or it may occur from general exhaustion of the vital powers. Perfect recovery usually takes place between the fifth and eleventh days by the supervention of critical perspirations, by critical bilious discharges, or by the appearance of vesicular and pustular eruptions. Sometimes the disease gradually abates after the seventh, fourteenth, and twenty-first days. When remittent is converted into intermittent fever, the change usually takes place after the third or seventh day, taking the form either of quotidian, double tertian, or tertian ague. The other diseases which remittent fever usually passes into, are such as depend upon lesions of the organs which have become complicated with it; the most usual are, hepatitis, chronic disease of the liver attended by dropsy, and dysentery; besides which, cases are mentioned of pulmonary disease, permanent insanity, hydrocephalus, disease of the kidneys and bladder, together with a tendency to obstinate ulcerations, especially of the lower extremities.

V. ANATOMICAL CHARACTERS.

The appearances which have been met with after death, in those who have suffered from remittent fever, are numerous, and, in many respects, not unlike those observable in intermittents.

The external appearances are, a collapsed state of the body, general yellowness of the surface, with here and there livid spots. On examining the *head*, a small quantity of fluid is usually found between the cranium and dura mater. The dura mater is inflamed and its vessels are turgid; the vessels of the pia mater are particularly so; and between it and the arachnoid, masses of coagulable lymph are often deposited. The ventricles are frequently distended with serum, and the choroid plexus is deeply injected. Burnett says, that the thalami and corpora striata have a firm glandular consistence. In the cavity of the *chest* inflammation of the pleura, with serous effusion and adhesions, and inflammation of the bronchial membrane, with an engorged state of the parenchymatous structure of the lungs, are met with. The heart is usually flaccid and easily torn. In the *abdomen*, the liver is found enlarged, injected, and softened in structure, and is generally of a dark, sometimes of a gray colour. [The investigations of Dr. Stewardson, of Philadelphia, led him to believe that the essential anatomical character of remittent fever was a peculiar alteration in the colour of the liver, which he thus describes. "This colour more or less resembled bronze, or a mixture of bronze and olive, or some shades of lead colour. The most correct idea of the colour would per-

haps be conveyed by stating its predominant character, the same in every case, to be a mixture of gray and olive, the natural reddish brown being nearly extinct, or only faintly to be traced. This alteration existed uniformly or nearly so throughout the whole extent of the organ, except in a single instance, where a part of the left lobe was of the reddish-brown hue. As the alteration of the colour pervaded both substances, the two were uniformly blended together, and the aspect of the cut surface remarkably uniform."* The observations of Dr. Stewardson have since been confirmed by Dr. Swett, of the New York Hospital,† Dr. Howard, of Baltimore,‡ Dr. Powers, of Baltimore,§ and Drs. Anderson and Frick, late Resident Physicians of the Baltimore Almshouse Infirmary.‖]

The gall-bladder contains a small quantity of inspissated bile, which is sometimes very dense and hard. [In seven out of eight cases, in which the state of the gall-bladder is recorded by Drs. Anderson and Frick, it was distended with thick grumous bile, resembling molasses. In the eighth case it was moderately distended with straw-coloured bile.] The stomach is usually inflamed, especially towards its cardiac orifice, and in many places covered with a chocolate-coloured gelatinous matter. The intestinal canal presents much the same appearances as the stomach; occasionally there are slight ulcerations. The intestines are almost invariably distended by flatus to a most unusual extent. The kidneys are frequently inflamed; the bladder contracted, and its inner surface covered with blood. The mesenteric glands and pancreas are often enlarged, as is likewise the spleen, which, in its broken-down character, resembles the appearances presented in ague. The whole muscular tissue is softened, and seems to have lost its tone and contractility.

[The glands of Brunner in the duodenum were found by Drs. Stewardson, Frick and Anderson, to be unusually developed, and sometimes to a remarkable degree. In Dr. Swett's cases this condition was not observed. Drs. Stewardson, Gerhard, and Swett state the glands of Peyer to have been healthy in all their cases; whilst Dr. Richardson, of New York, says that they were diseased in all the cases of remittent fever he examined at the New York Hospital, in 1840;¶ and Drs. Geddings of Charleston, Vache and Stevens of New York, Harrison of Cincinnati, and Jackson of Philadelphia, particularly mention the fact of their alteration in cases examined by them. In Drs. Anderson

* [Am. Journ. Med. Scien., April, 1841, and April, 1842. Elliotson's Practice of Medicine, p. 344.]

† [Am. Journ. Med. Sciences, Jan., 1845.]

‡ [Ibid., Jan., 1845.]

§ [Stewardson's Edition of Elliotson's Practice, p. 345.]

‖ [Am. Journ. Med. Sciences, April, 1846.]

¶ [New York Journ. Medicine and Surgery, 1841.]

and Frick's cases, the agminate glands were generally visible, and in several the mucous membrane over them was injected, and sometimes softened. Of nine examinations after death from the African remittent fever, made by Dr. M'William, in three the patches of Peyer were distinct and enlarged.]

VI. DURATION.

The *duration* of remittent fever is influenced by many circumstances, but more especially by the form which it assumes. The simple is the most protracted, occasionally extending from two diurnal paroxysms to a period of five, six, or even eight weeks.

The inflammatory form, under favourable circumstances, does not maintain its acute character longer than three days, but ultimate recovery is much longer deferred. In fatal cases death frequently ensues on the third exacerbation, though it is generally delayed until the fifth or seventh day. In the malignant form, death has been known to occur in the first paroxysm; but it is usually postponed until about the third or fifth day. In favourable cases the convalescence is often very protracted.

VII. PROGNOSIS.

The circumstances which indicate a lingering attack, or a fatal termination, are symptoms denoting inflammatory complication, especially in the brain or its membranes, a depressed state of the system, or coma supervening upon delirium. Death may also be expected, when the remission is but slightly marked, when the skin assumes a deep yellow tint, but especially when suppression of urine, diarrhœa or dysentery supervenes.

A favourable termination may be generally looked for, if, at the commencement of the disease, the premonitory symptoms be well marked and of moderate duration; if the headache, pain in the epigastrium and prostration of strength be not considerable; if the pulse be soft and of moderate strength, the surface uniformly moist and not clammy to the feel; and if there be absence of severe gastric affection, of dyspnœa, singultus, subsultus and the yellow colour of the skin; if the bowels be moderately open and free from pain or distension; if the eyes be not suffused, nor the conjunctiva yellow; if the thirst and other febrile symptoms abate, and more especially if the mouth and face become covered with eruptions. [Dr. Boling says, that a favourable change is earlier indicated by the secretion of the mouth and tongue, than by any other sign, "probably because more readily brought under immediate observation. Even when the tongue is quite dry during the exacerbations, a degree of moisture is apt to appear, at least upon its edges

and lower surface, during the remissions; and that a favourable change is about to take place, or has already done so, and that the coming exacerbation will be less severe than the preceding, may frequently be inferred from the slightest increase of this moisture, during a remission, upon what it had been during the previous one."*]

The chief circumstance in the history of remittent fever which tends to embarrass the prognosis, is the occurrence of the calm on the third day already alluded to. Although this almost total intermission from disease often proves critical, and the forerunner of recovery, it must always be viewed with the most careful suspicion, when it supervenes upon symptoms in any way characterized by severity or malignancy.

The susceptibility to remittent fever appears equal in both sexes, and at every period of life; but males, from their occupation, are more exposed to its exciting causes. Soldiers and sailors serving in hot latitudes, where the peculiar miasm occurs, are very liable to it. Individual constitution exerts great influence, both in respect to the primary susceptibility to remittent fever, and the character it may afterwards assume. Generally speaking, the inflammatory variety prevails in those of a plethoric habit, the malignant among the weak and languid, persons of a bilious habit, those who are weakened by previous disease or intemperance, or who have frequently suffered from gastric irritation. Climate and situation evidently exert a manifest influence on remittent fevers. In districts where the miasm is generated, places near its origin, or low and ill-ventilated localities, one or other form, but more especially the malignant, prevails. In temperate countries it usually assumes the simple and inflammatory character.

Every variety of the disease appears to be most severe in the autumn, and to be influenced by changes in the weather; thus it is observed to be particularly severe after a very wet summer; in a hot summer after a wet spring, or during a wet season after previous heat. In the tropics it has been frequently noticed to prevail epidemically, when the summer has been unusually warm after a peculiarly wet season. If the disease occur in the early part of summer, the cerebral symptoms predominate; while after August, or during the autumn, the gastro-enteric complication, with tendency to dysentery, prevails. Dr. Craigie says that in very dry summers, where the winds are light and infrequent, and the atmosphere calm and undisturbed, remittent fevers are more frequent in occurrence, more rapid in progress, and more violent in symptoms.

* [Boling, loc. cit.]

VIII. NATURE.

What has been stated as to the causes, both proximate and remote, of intermittent fever, applies in great measure to remittent. As regards the proximate cause, those who advocate particular theories as to the nature of fever in general, see them illustrated in the phenomena of remittents. Cullen, who considers this form to be a variety of the intermittent fever, refers its immediate origin to spasm of the extreme vessels. Pinel, who believes that remittents arise from disease in the capillaries of the brain and stomach, terms them *meningo-gastric;* while Dr. Craigie, one of the last who has followed out this view, says that this morbid action is not so exclusively confined to those parts as to justify their being so called; but that the process of remittent fever, whatever it be, is evidently diffused over the whole capillary system of the brain, the lungs, the alimentary canal, the secreting glands, the liver, pancreas and kidneys, as also over the muscles and bones. In short, that it is like fever generally—an affection or disorder of the capillary system of the whole frame. He endeavours to explain the phenomena upon the supposition, that although this capillary disorder be general, yet it displays its effects more conspicuously in different organs at different periods of this disease, and that the stages of remittent fever are the result of these changes. (*Practice of Physic.*)

Dr. Stevens attributes the origin of this fever to a disorganized state of the blood, as evinced in its black crimson colour, which he states to be a certain proof of the entire loss, or at least of a great diminution, of its saline ingredients. It must be admitted that a great many of the phenomena of fever cannot be explained upon the supposition of local inflammation being its sole cause; and accordingly Dr. Stevens has endeavoured to show that in fevers produced by marsh miasm, or by contagion, the diseased action in the solids is as much the effect of the altered condition of the blood, as it is in those cases where fever is induced by injecting a putrid or poisoned fluid directly into the circulating current; and that the remote cause first poisons and chills the blood, and after a time paralyzes the heart's action, thus giving rise to the cold stage. According to this theory, the first link in the chain of morbid phenomena in essential fevers is, the vitiation of the blood—a condition existing even before the attack in all the fevers produced by aërial poisons: and that to this cause are also to be attributed the functional disease in the solids, the derangement in the secretions, and the sudden variations in the temperature, not merely of a part, but of the whole system. Though Dr. Stevens is perfectly correct as to the fact, that the state of the blood is very different in fever from

that in health, yet we must repeat our conviction, that there is much wanting before his views can be undeniably established.

From the affinity which remittent disease bears to intermittent, there is every reason to believe that they are produced by the same remote causes: observation fully justifies such a view; and all writers agree that the remittent fevers arise chiefly from marsh exhalations. On the other hand they have appeared during the intense heat of tropical climates, and in such instances they doubtless originate in terrestrial exhalations. We believe, however, that this origin is less frequent than has been supposed, and that more accurate observation will show, that there are in these localities, marshes, undrained sands, or other sources of miasmatic exhalations, which had been overlooked. It has been remarked, that when remittent fevers arise from rapid terrestrial desiccation, they are very violent, approaching the malignancy of yellow fever.

Whatever may be the nature of the specific poison thus exhaled, it appears capable of remaining dormant in the system for several weeks, and, according to Dr. Stevens, for an incredible length of time, even for months, without producing its specific effects. He likewise thinks, that it may be neutralized or so altered in its properties, as to be incapable of producing its peculiar action on the human system. This view is founded on the observation, that in the Genesee country, where the inhabitants during the hot months are exceedingly subject to violent and often fatal attacks of the marsh fever, those persons who are employed in the saltworks remain exempt from the marsh fever, although the salt factories are situated in the lowest part of an extensive swamp.

IX. DIAGNOSIS.

The diseases with which remittent fever may be confounded are chiefly the quotidian and double tertian intermittents, the yellow fever, and the seasoning fever, of the West Indies.

The continued febrile condition, and the vomitings and tendency to discoloration of the surface, are, however, characters which sufficiently enable us to distinguish it from the intermittents; at the same time the passing of the one into the other is so frequent, that accuracy in diagnosis is rendered difficult, and not always to be relied on. In fact, many authors have described them as varieties of the same type, as they likewise have the yellow and the seasoning fever of the West Indies, between which and the remittent diagnosis is more difficult. It appears, however, now to be well ascertained, that they are distinct diseases; but this opinion has in great measure obtained rather from their general history than by any very defined differences in their symptoms. Dr. Stevens states, however, that they are totally separate and dis-

tinct from each other, and easily distinguished, particularly in the beginning.

The yellow fever differs in the following particulars:—Though the patients may suffer from a sensation of cold, they never shake or tremble. The fever is never of one type, but is invariably continued. There is an expression of the countenance which is peculiar to it. Dr. Stevens says, that though it is not so marked as the expression in tetanus, it is so distinct, that those who have seen it once easily recognize it. The stomach is irritable even from the first, and the liver is affected early in the disease; the bile is peculiarly acrid, corroding the ducts, and inflaming the intestinal canal. There are generally cramps, which rarely occur in remittent disease. But of all the distinguishing characters the most certain and constant is the black vomit of yellow fever: it is not unlike sooty water, a character of vomited matter which never prevails in remittents.

From the seasoning fever of the West Indies it may easily be distinguished, as this is characterized by having no premonitory stage nor cold fit, no inflammation of the stomach or liver, by the tongue being clean, and the pulse full and incompressible. That these several collections of symptoms to which these different names have been given, are essentially distinct diseases, is rendered quite obvious when their whole history is taken into consideration. To enter upon this would, however, not only be too lengthy for the limits proper to the discussion of this disease, but would in great measure be otherwise out of place.

[The diagnosis between remittent fever, and the common type of continued fever in this country, is, in general, very easy, even when the remissions are indistinct, and the disease is said to run into the continued form. The absence of many of the prominent and almost distinctive features of the prevalent form of continued fever, will usually enable us to make the distinction with certainty. In remittent fever there is no eruption, so far as observed, either rose coloured or measly, nor any petechiæ, or vibices; there is no constant tenderness, with gurgling on pressure in the right iliac region; the intelligence is usually good, and the peculiar besotted expression of the face in marked typhoid fever is wanting. The absence of these symptoms, with the peculiar features of remittent fever itself, will, we think, prevent the two diseases from being mistaken.]

X. TREATMENT.

The indications of treatment in remittent fever do not materially differ from those of continued fever, which have elsewhere been fully treated of. The points more particularly to be attended to are, the reduction of the general fever, the obviating the effects of

congestion and inflammatory action in the liver, stomach, and intestines, as also in the brain and its membranes.

The disease of the general state of the system is to be obviated by the prompt administration of purgatives, in order to clear the primæ viæ from the morbid secretions found in the stomach and intestines; the reduction of the over-excited heart's action by blood-letting, and the use of medicines of a diaphoretic nature. With the exception of some of the French writers, all practitioners agree on the necessity of administering purgatives; at the same time they are to be used with considerable judgment, as much mischief frequently accrues from their abuse. If violent and irritating cathartics are too unsparingly administered, they are very apt to set up an irritation in the mucous lining of the bowels, which is attended by consequences so imminent, as often to be the source of more serious alarm than the effects of the disease itself. There can be no greater mistake in the treatment of remittent fever, than the exhibition of a rapid succession of this class of medicines. They tend rather, by their local irritation, to increase the acrid nature of the secretions. At the same time it is absolutely necessary, especially at the onset of the fever, that effective evacuants should be administered; but those selected for this purpose should be but little irritating or drastic in their operation. The use of purging enemata will be found very useful adjuncts to the employment of purgatives, but they must by no means be solely relied on; and where there is much gastric irritation, and there are but few cases where there is none, a small quantity of the syrup of white poppies should be added, the addition tending very much to allay pain and to soothe the system.

The employment of mercury has been much canvassed by practitioners; the greater number recommend its employment, but the extent to which its exhibition has been pushed by some, we feel persuaded, cannot be advantageous. Dr. Eberle (*Practice of Physic*), however, who for more than fifteen years employed this remedy in nearly every case of remittent fever that came under his superintendence, administered it very freely during the two or three first days after the attack. Though he states that a gentle mercurial impression is beneficial, he condemns strong mercurialization or ptyalism. In the great majority of the cases he treated, he found all the symptoms of the disease abate, often very considerably, as soon as the mercurial influence became evident, and that in many instances a speedy convalescence ensued. To obtain these results the calomel should be early and regularly administered, and continued until slight manifestations of its specific influence on the system have become evident by soreness of the gum, when its use must immediately be suspended. Many, however, are much more strenuous advocates for its exhibition; but even those agree in condemning its use except in the earlier stage. (Ferguson, *Med. Chirurg. Trans.*, vol. ii.) After the fifth or sixth day its

constitutional operation is obviously productive of mischief. As calomel is very apt to produce active purging, it is generally advisable to combine with it a small quantity of opium, perhaps the Dover's powder is the most advantageous form. We should strongly recommend, that unless there be signs of congestive or inflammatory action present, calomel as well as active purgatives should not be resorted to. The thin, watery, muddy, reddish, and fetid stools, the tympanitic and tender state of the abdomen, and the cerebral irritation which frequently occur in the latter period of the disease, are very generally the results of the frequent use of active and irritating cathartics. The course to be pursued in respect to the use of this class of remedies, is to exhibit on the very commencement of the disease an active purge, either the extract of colocynth by itself or combined with mercury, followed by the mildest evacuants, so as to produce two, certainly not more than three, evacuations in the twenty-four hours. This action should be gently maintained during the progress of the fever, and, for this purpose, Seidlitz powder, small doses of Epsom salts, castor oil, or rhubarb, are the most convenient. The employment of a mixture composed of magnesia and castor oil has been much recommended. It is made by mixing very intimately an ounce of the oil with a drachm of the carbonate of magnesia, with the addition of about an ounce of any of the usual syrups: of this a quarter part is to be taken every hour, or every two hours, until the bowels are moved.

The use of emetics has been much approved of by some practitioners, but the majority are decidedly averse to them. They appear peculiarly liable to upset the stomach, a condition which is apt to supervene without any cause of this kind, and is at all times very alarming and difficult to control. The too common result of their employment, during the first stage, is to set up a gastric irritability, and in the more advanced stages to increase the tenderness and tympanitic tumefaction of the bowels. Under such circumstances the disease is apt to run a tedious course, the abdomen remaining sore on pressure, and the alvine discharges often becoming watery, reddish, and irritating, in their passage through the lower bowel; in short, there is every manifestation of great irritation, if not of inflammation, in the intestinal mucous membrane. Lind is decidedly opposed to their employment, and states he can assert with confidence, that when given in doses which produce full vomiting, they are attended by the most unfavourable effects, headache, vomiting, and all the local affections, being much aggravated by their use. They seldom or never succeed in removing nausea, or in producing a critical perspiration; but, on the contrary, appear to hurry on, with greatly increased gastric irritation, the second stage of the disease.

Blood-letting formerly was esteemed, if not a very injurious mode of treatment, at least to be very equivocal in its effects. In

the present day blood-letting, both general and local, is almost invariably resorted to. For an appreciation of the true value of this remedy we are greatly indebted to Dr. Irvine, who published the results of this mode of treatment in the cases of remittent fever that came under his observation in the Mediterranean. These results were most satisfactory. The statements of Sir William Burnett are also highly confirmatory of its being a most valuable mode of treating this disease. He says, that in the first stage of the disease, the inexperienced or inattentive observer is too apt to be led astray by the prostration of strength, the watery eye, the oppressed pulse, the anxious look of the patient, and the disposition to syncope on abstracting a few ounces of blood from the arm. The disease, however, is at this time a purely inflammatory one, and easily managed: blood-letting, both general and local, should therefore be resorted to, and repeated according to the urgency of the symptoms. It will often happen, after a few ounces of blood have flowed, that syncope will be induced: this must not prevent the repetition of the bleeding as long as the symptoms in any way indicate that it is required. In the course of an hour after the fainting is recovered from, it may generally be repeated even to the extent of thirty or forty ounces without again producing it. He moreover affirms (*op. cit.*, p. 21) that syncope is less likely to occur when the blood is taken from the temporal artery; a mode of abstracting blood he particularly advocates. He states that he has often seen a bleeding of thirty ounces from this artery, aided by a brisk purgative, put an end to the disease; the headache, if not entirely removed, being greatly ameliorated; and that in many instances so immediately, that the patient has declared he felt the pain escaping with the blood. If before this evacuation the pulse should have been oppressed, it will rise under the lancet, and patients who have been carried, so great has been the apparent debility, have, after the loss of the thirty ounces of blood, risen and walked about, expressing their surprise at their former condition. The relief thus obtained is not in all cases permanent; the patient must be carefully observed, and on a return of headache, increased vascular action, heat, or other symptoms of pyrexia, the lancet must again be resorted to.

Though bleeding is now universally allowed to be a judicious operation in remittent fever, yet it must be borne in mind that age, constitution, and climate, modify very much the extent to which it is to be pursued. This is, however, so obvious, that it scarcely requires being alluded to. It may nevertheless be not out of place to observe that the English, who visit countries where it is endemical, and there become subject to the influence of remittent fever, bear, for the most part, abstraction of blood to a much larger extent than is usual in the natives themselves; and also, as a general law, that in very dry climates it is a safer remedy than in the humid.

To obtain an uniform perspiration is of the utmost import-

ance. At least such is the view we entertain, though it is opposed to that of Burnett, who states that sudorifics have never appeared to him to be attended with the smallest advantage, especially when employed in the early stage. He says, that it is well known to every practitioner, that they often fail in inducing perspiration, and, under such circumstances, their general action cannot but be highly unfavourable; and, at the commencement of the disease the patient is often covered with a profuse perspiration, from which he derives no relief. We cannot but view this statement as overcharged and erroneous. Most writers agree that saline draughts, the acetate of ammonia, and medicines of that class are eminently useful, especially when the warm or tepid bath, or even cold sponging, is employed to aid their effect. These may be employed according to circumstances, with the best effects, especially if, after due evacuation, an undue vascular action, with headache, remains. Connected with the subject of saline medicines, we must mention the plan recommended by Dr. Stevens. It consists in the free use of neutral saline salts, those which he more particularly recommends being the carbonate and chlorate of potass. There can be no doubt that these are of great service, but scarcely, in our opinion, to the extent which he has been led to imagine.

If the disease show disposition to localize itself, depletion and the application of counter-irritants should immediately be resorted to. Should the stomach or bowels be the chief seat of irritation, a large poppy-head poultice will often give speedy and permanent relief. In addition to these, mild diluents should be freely allowed.

Such, then, is the general line of treatment to be followed in the first stage. As the disease advances, however, the remedial means which have been hitherto employed must in a great measure be desisted from, or, at least employed only with great caution. To the local affection the attention of the practitioner, in the after period of the disease, should in a great measure be directed, as from it most usually the severity of the symptoms proceeds. The topical application of leeches, or a blister to the neighbourhood of the affected organ, should be resorted to, and tepid bathing and saline remedies at the same time employed, together with the administration of saline draughts, or of the neutral salts.

Should the disease, notwithstanding the means pursued, arrive at its third and most dangerous period, little more is to be done than to keep up the strength of the patient by such diffusible stimulants as are usual in the last stage of typhus fever. Ammonia, combined with aromatic confection, has been particularly recommended under these circumstances, as have also musk and valerian; these latter remedies we believe to be very valuable. The oil of turpentine, in doses of thirty drops, is perhaps one of the most safe and useful medicines in this stage; it often immediately controls the character of the symptoms, and changes entirely the nature of the alvine secretions. In this stage the patient may be allowed anything he

may desire, in the way of nourishment or stimulants, as sago, arrow-root, spiced wine, porter, brandy, &c. The camphor julep is said to be very useful in allaying the singultus, which is so painful a symptom in the closing scene.

Such is the general sketch of the treatment which experience has taught to be most useful in remittent fever. It would have been out of place to have gone very minutely into a discussion upon it, as in a great measure it is similar in its essential details to that pursued in ordinary continued fever.

When a complete remission is procured in the early stage of the disease, and this is followed by convalescence, it must be borne in mind that though a very urgent desire for food immediately takes place, it cannot with safety be indulged; indeed, the convalescence of no disease is so likely to be retarded, as that of remittent fever, by injudicious or excessive diet. The most proper is that which is mild and nutritive, and not that which is stimulating. It is but rarely in the first days of convalescence that wine or bitter infusions are required.

Before concluding this sketch of the treatment, it will be necessary to say a few words on the use of those tonics, the employment of which in intermittent fever is so beneficial. Their employment in the treatment of this disease has, however, excited much difference of opinion. Some practitioners, amongst whom are Lind and Clark, have advocated the use of bark immediately after the remission has set in, while others, among whom are Johnson and Burnett, most strenuously condemn it. The former speaks most decidedly, affirming that the exhibition of Peruvian bark, while symptoms of pyrexia remain, has been attended by the most mischievous effects. He says, that, under its use, the mortality has been great, relapse frequent, and dysentery almost universal, in those who had the fever in a severe form; nor was there an instance, when given during the supposed remission of the symptoms, where it prevented a return of the paroxysm. Too often this medicine has been given with wine at the commencement of remittent fever, the consequence of which has been, that the tongue has put on a brown, dry, and furred appearance; the anxiety, delirium, and irritability of stomach, have been much increased, while the whole train of nervous symptoms have soon become formidable, resisting every means of alleviation, till death has put a period to the sufferings of the patient.

[In the treatment of remittent fever in this country, the simple expectant plan is the one which has been generally of late recommended by those who have had much experience in the disorder General blood-letting is in most cases not required, particularly in our southern latitudes, where great caution is required in its use; it is, however, said to be better borne by northerners in such cases, than by the native inhabitants. When decided indications exist for the use of the lancet,—general arterial excitement, as shown in the

wild bright eye, intense cephalalgia, hard, full pulse, hot surface, and injected face—it should promptly be resorted to, and great relief will frequently follow; but it will rarely be found necessary to repeat it. Local bleeding, on the contrary, is most generally of great utility, in relieving many of the prominent symptoms,—as the gastric irritability, tenderness or pain of the epigastric and hypochondriac regions, and the pains in the back. Emetics are now generally abandoned in the treatment of this form of fever, it being found that they aggravate the gastric distress, which is usually so annoying. If, however, it is found necessary to empty the stomach at the commencement of an attack, the mildest means that will effect the object, should be resorted to. A full dose of calomel (grs. x.) may be given in the first paroxysm, followed by castor oil, or a saline cathartic. No benefit can be derived from a course of systematic purging afterwards, and much harm may result. It is important, however, to keep the bowels open with mild laxatives, care being taken to select those which may not offend the stomach, and by enemata. As to the specific influence in this disease of mercury, no satisfactory evidence has, in the opinion of the writer, been adduced of its utility. Small doses of calomel, blue pill, or hydrargyrum cum creta, combined or alone, may be highly useful as adjuvants in the general plan of treatment, as in that of other diseases. The apartment of the patient should be kept cool, and he should not be oppressed by too much covering to his bed. Cold sponging, with water, or vinegar and water, is generally excessively grateful, when the skin is hot and dry. Dr. Dickson speaks highly of the effects of cold water, and particularly of the cold affusion, which he is disposed to regard as among the most efficient of our febrifuge remedies. "All that we can hope or anticipate from blood-letting," says he, "may be obtained in a majority of cases by the use of the bath, while the latter possesses this striking and obvious advantage, that we can repeat it as often as the symptoms are renewed that require it. Nor can I help expressing my surprise at the very limited resort of my professional brethren to it, when I consider how instinctively we desire it as a relief from the burning heat that oppresses us, and how certain and immediate a means it is of affording this relief. Of the three modes of employing it, affusion, namely, immersion and ablution, the first is the most impressive and efficacious, the last the least liable to objection or risk in doubtful cases. The particular indications which demand the resort to it unhesitatingly, are found in the youth and general vigour of the patient, and the heat and dryness of the surface. The local determination which it controls most promptly is that to the brain, shown by headache, flushed face, red eyes, delirium, etc., with a full, hard, bounding pulse. Seat your patient in a convenient receptacle, and pour over his head and naked body from some elevation, a large stream of cold water; continue this until he is pale, or his pulse loses its fullness, or his skin becomes corrugated, and he shivers.

On being dried and replaced in bed, a genial sense of comfort and refreshment will attest the benefits derived from the process, which, as I said above, may be repeated whenever the symptoms are renewed, which it is so well adapted to remove. If the shock of this shower bath or cataract be too great, immersion, which many prefer, may be substituted. Few shrink from this, and almost every one will evince the high gratification and enjoyment derived from it. One of the pleasantest effects following the bath, is the complete relaxation of the surface which it so often brings on, attended with a copious and salutary sweat. I need not warn you against the nearly obsolete practice of endeavouring to accelerate or increase this by wrapping in blankets or shutting up the apartment, or warming it artificially. The patient is to be covered agreeably to his sense of comfort; and though I would not place him in a current or draught of air, I would have his chamber fully and freely ventilated. Some have strangely enough imagined it to be necessary that evacuations of some kind should be premised to the application of the cold bath, but this is a worse than superfluous caution. It does positive harm by postponing the remedy until the time of its most special adaptation and greatest utility is past—the earliest and forming stage of the febrile attack. It is here, I repeat, that you will find it most admirably beneficial. Yet you will meet with frequent occasion to advise its repetition at intervals, throughout the whole progress of the disease; and even when the patient can no longer bear either affusion or immersion, he will often be relieved and gratified, by washing and sponging him, especially over the hands, arms, breast, feet, and legs. In the very latest stages of our worst fevers, ablution in this way with ardent spirits, is found singularly refreshing. The affusion of cold water locally upon the head in a stream of some height, by the spout bath, is of inestimable advantage in cases where the cerebral determination is inordinately violent, dangerous or tenacious; and will bear to be repeated far oftener than it would be proper to take the patient out of bed for the administration of the general bath. Support him in a leaning posture over the bedside and dash the current from a pitcher over the vertex for some minutes and from some elevation above him. Many who dislike all the other modes of using cold water, entreat for this operation as the most soothing of possible indulgences; nor have I yet met with any ill consequences from allowing its most unlimited frequency of repetition. The cold bath in its several modes of general application is prohibited, let me remind you, when the patient is of feeble habit of body; much advanced in age; much exhausted or enfeebled at the time; when the pulse is weak, or the skin cool, or covered with moisture; when the lungs are oppressed or inflamed; and when diarrhœa is present. Its repetition is forbidden when it has occasioned a protracted chill or rigor, or the patient has continued to feel cold or uncomfortable from it." Excessive irritability of stomach is a frequent and very troublesome symptom. Ice

in small pieces, the effervescing mixture, and other remedies of this kind may be administered for its relief. To moderate the excessive thirst, ice, iced water, and acidulated drinks may be allowed. Lemonade, tamarind water, and a weak solution of cream of tartar, are, in general, very grateful. With regard to the administration of quinine some difference of opinion prevails. As a general rule, the more decided the remission, the greater its utility; in the inflammatory form, it is generally of little advantage. Where the remissions are well marked, or where there is a tendency to prostration, it is, on the contrary, of the highest value, and should be administered in doses of from five to ten grains, frequently repeated before the anticipated exacerbation. Stimulants sometimes are necessary towards the termination of the disease. Of these, capsicum, wine, brandy, and ammonia, with infusion of serpentaria or valerian, and nourishing food, are very beneficial. Convalescence should be carefully watched, as relapses are easily induced by imprudence. The diet should be digestible and nutritive, and the body should be well guarded against any vicissitudes of climate. The secretions generally should be attended to, and moderate exercise prescribed with the returning strength. The mild bitters will often materially assist us in restoring the powers of the stomach.

The congestive form of remittent fever requires prompt and vigorous treatment. The chief indications are to procure reaction, and to prevent a recurrence of the paroxysm. To effect the first, sinapisms should be applied over the stomach, chest, between the shoulders, and on the extremities. Blisters are recommended by some practitioners as preferable, whilst others advise that they should replace the sinapisms, when these have commenced to excite irritation of the surface. Stimulants must be freely given internally, quinine, camphor, capsicum, &c. The quinine must be given in large doses, (grs. v. to x.,) at short intervals; it should be combined with capsicum or camphor, or if there is severe vomiting, the oil of turpentine may be substituted for the camphor. The evidence in favour of large doses of quinine repeatedly given in congestive fever, is ample and convincing. Calomel is generally combined with the above remedies, and is administered during the paroxysm, to the amount of fifteen or twenty grains.]

CHAPTER VIII.

INFANTILE GASTRIC REMITTENT FEVER.

[Syn.—*Remittent Fever of Children, Spurious Worm Fever; Febris verminosa, Hectica Infantalis, Febris Mucosa verminosa, &c.*]

Many of the names by which this disorder of children has been at various times known, have been applied either from some supposed cause of the symptoms, or from some prominent characteristic of the disease itself. Thus it has been called *the worm fever—the mesenteric fever—the stomach fever—the low fever of children—infantile hectic—the infantile remittent fever.* On a careful examination of the history and symptoms, as given by various authors of former and recent times, we are satisfied that much confusion has arisen, sometimes from imperfect attempts to separate into distinct diseases what are in fact but early and later stages of the same, and on the other hand, from an opposite error of confounding what are accidental complications, with what may be considered as the regular and simple form of the complaint. There is apparently a striking conformation of the modern doctrines of Broussais as to the nature of fever, in the acknowledged cause of this infantile disease. The most prominent symptoms are referred to the mucous lining of the stomach and intestines; an acute or a protracted form of fever is the result; and with an improved condition of the alimentary canal the febrile paroxysms are mitigated and gradually disappear. In the various forms of continued fever there is so much diversity in the complications of local lesions, as well as in different seasons, and in different epidemics, as materially to detract from the soundness of, if not to disprove, the doctrines of this celebrated pathologist. In the fever under consideration, however, no such diversity exists. The description given by the first distinct writer on the subject, Dr. Butter, of Derby, in 1782, agrees in all essential points with that published twenty-four years afterwards by Dr. Pemberton, the accuracy of which is admitted by the most recent writers and practitioners. Dr. Butter, in his work on *Infantile Remittent Fever*, has divided the disease into the *acute*, the *slow*, and the *low* form. Dr. Underwood, who published the first edition of his work on *Diseases of Children*, two years after Dr. Butter's treatise appeared, gives the name of infantile remittent only to the very mildest form of the complaint, and devotes but a very short chapter to what he considers a fever, "remarkable for being

always devoid of danger." In alluding to Dr. BUTTER's recently published work, he clearly considers that he has exaggerated the importance and severity of the disease. But UNDERWOOD proceeds to describe in subsequent chapters, the *typhus* or low fever, and the *hectic*, which are evidently identical with the *low* and the *slow* forms of BUTTER.

For practical purposes we are of opinion that the division into the *acute* and the *chronic* will be sufficient; and that in describing these two forms there will be ample opportunity to notice all the necessary details, whilst the arrangement will be much simplified.

I. ACUTE INFANTILE REMITTENT FEVER.

I. SYMPTOMS.

IT is not in earliest infancy that this disease is most commonly met with—indeed, many have denied its existence in children during the period of lactation. It is most frequent from the age of two to six; but preserves its peculiar character up to the age of puberty, though, the older the child grows, the less marked are those peculiarities of type. In the *acute* form, the symptoms often come on very suddenly. The child perhaps goes to bed apparently as well as usual, and in an hour is found with a burning skin, a flushed countenance, an injected eye, and a very rapid pulse, varying perhaps from 120 to 160. There is intense thirst, with a dry tongue, which soon becomes coated and covered with a thick white fur; the child is restless and wide awake, often delirious, but able to answer questions or do as directed. If old enough, the child often complains of pain in the head and sometimes in the abdomen, the parietes of which are generally more hot than any other part of the body; indeed, the feet are often cool or cold. There are occasionally sickness, and vomiting of sour and offensive, or of greenish or yellow fluid. If the proper remedies be used, in a few hours the skin becomes cool, perspiration breaks out, the tongue is found to be moist, the pulse softer and more quiet; the child falls into a deep and refreshing sleep, and on awaking appears nearly as well as the day before.

When the attack originates in a *single* meal of improper or undigested food, which has been dislodged by the appropriate treatment, such a speedy and favourable termination of the symptoms is not unusual. The name of *remittent* fever, which is so generally applied to the confirmed disease, would in such a case be inappropriate; but such is the history of the disease in its first stage and most simple form. It is rare, however, to find the cause so limited, and then the history is somewhat different; where, instead of a single error of diet, there has been previously an accumulation

of ill-digested or of improper articles of food in the alimentary canal, although the attack may begin as suddenly, the termination is not so abrupt or satisfactory. Instead of the child being free from fever in a few hours after the onset of the paroxysm, there is only a remission of the symptoms; there are languor and fretfulness in the morning; the tongue is moist, but continues coated; the skin is cool, but dry; the pulse is quicker than natural, but not so rapid as during the accession of the symptoms; there is often drowsiness, and generally loss of appetite; the urine is scanty and high-coloured, and often deposits a white sediment. These remaining symptoms may be present more or less for several hours, though occasionally the child seems lively, takes notice of, and interest in its usual pursuits, and is apparently nearly well. Towards evening, however, it becomes more restless and uncomfortable, and a distinct exacerbation of febrile paroxysm, often more intense than that at the onset of the disease, takes place, running the same course, and followed in the space of a few hours by as remarkable a remission. The condition of the bowels is one of the most uniform characteristics of the disease. Sometimes there is diarrhœa, much more commonly, however, constipation; but in either case the evacuations are highly offensive, the fetor resembling putrid meat. They are dark, pitchy, or clay-coloured, with little or no admixture of bile, or the biliary secretions appear vitiated and unmixed with the general mass. When the bowels have been previously confined, the accumulation of morbid secretions is usually enormous, and dose after dose of active purgatives is necessary to dislodge the offensive load. After the bowels have been cleared out, the dejections are still highly fetid, dark, and slimy, and their character is found to improve with the subsidence of the febrile accessions. In the course of the disease the breath early shows a faint and often an offensive colour, the coat on the tongue becomes more yellow or dirty, and the child is noticed to be frequently picking its lips, its nose, the corner of its eyes or its fingers. There is also not uncommonly a short hacking cough. As convalescence approaches, the paroxysms of fever become less marked, take place at a later hour, and last a much shorter time. The intervals of remission are longer, and are indeed almost complete intermissions, the child becoming more lively, returning to its natural habits, and recovering its appetite and strength. In other instances the disease does not come on so suddenly. For a few days the child is heavy and fretful, with disturbed sleep, loss of appetite, and coated tongue; the febrile accessions are very slight and irregular, but go on increasing in length and severity, till the more decided symptoms appear, and run a similar course.

The *duration* of an attack of the acute form varies from a few hours to a week or a fortnight, after which it gradually assumes a

chronic form, and is often very protracted. The improvement in the condition of the alvine discharges is one of the earliest signs of recovery; they become less and less fetid, and more natural in appearance, and when the free and healthy action of the liver first begins, bright orange-coloured bile is frequently poured out in great profusion. The dejections are more decidedly feculent, and, if the food be of a proper quality, they are properly smooth and blended; the urine becomes more abundant, pale, and without lateritious deposit; the tongue becomes gradually clean; the disposition to pick the skin ceases; the sleep is tranquil and refreshing; the countenance is no longer subject to irregular flushings, or to the peculiar pallor during the remissions; the skin is soft, moist, and cool; the pulse tranquil; and convalescence is established. For a considerable time after this favourable termination, however, a slight error in diet, either as to quality or in quantity, will bring on a relapse. The same effect will often result from omitting to keep the bowels free from any accumulation, from the too early use of tonics, from exposure to damp air, cold, or mental or bodily exertion. Frequent relapses generally terminate in the chronic form, and it is important to bear in mind, that a frequent cause of relapse, as well as of some of the complications to be presently mentioned, is not unfrequently to be traced to the too long continuance of violent purgatives, or to the irritating nature of the remedies employed.

Without subscribing to the doctrine of Underwood, that this disease is "remarkable for being always void of danger," it is certainly true with respect to the *simple acute* form: we have never, indeed, met with or heard of a case terminating fatally; where death has occurred, the case has been at an early period complicated either with dysentery, or gastric or enteritic inflammation. In such instances the symptoms have been mixed, and the fever has soon lost much of its remittent character, though in all infantile complaints there is a great tendency to remissions, which observe a marked degree of regularity. The dysenteric complication is indicated by the appearance of the evacuations, which are frequent, attended with violent straining, consist almost entirely of mucus, and are often mixed with blood; while the acute pain in some part of the abdomen, increased on pressure, with retraction of the limbs, early tympanitis, and tendency to constant sickness, indicate the existence of intestinal inflammation. In the acute stage of these complications, the peculiar fetor of the evacuations soon ceases to be constant, and often entirely disappears; but it returns again after a time, perhaps, notwithstanding that the inflammatory state of the intestinal mucous membrane has subsided. By the majority of practitioners in this country, however, this absence of fetor of the stools, in the progress of the acute form of infantile remittent fever, is not considered to be at all uncommon, and they are unwilling to admit the existence of inflamma-

tion in such cases. The presence of pain, on the other hand, is by no means a necessary proof of the existence of inflammation, and the tenderness on pressure is often deceptive, as young children, in the fretfulness of disease, are exceedingly impatient of any sort of disturbance, and evince great dislike to pressure on the abdomen or any part of the surface. We must not lose sight also of the fact stated by Andral and others, that even the most severe and fatal forms of intestinal inflammations are often painless.

We have stated our belief, that when death takes place in the acute form of infantile remittent fever, the disease is complicated either with dysentery, or with inflammation of the mucous membrane of some portion of the alimentary canal. The appearances on dissection confirm this view; patches of the mucous membrane, generally of the small intestine, being softened, sometimes abraded, or inflammatory blushes and circles surrounding the mucous follicles. In some cases a pink blush pervades a considerable portion of the tube. In the instances where dysenteric symptoms have been most prominent, ulcerations in the ileum, cæcum, colon, or rectum, have been discovered.

II. CAUSES.

The causes of the acute form of the infantile fever are those which directly or indirectly disorder the digestive organs. When a child has been previously in perfect health, the bowels regular and natural in their functions, and the diet wholesome, the onset of the symptoms may be generally traced to some accidental deviation from ordinary diet. Although disorders of the stomach and bowels in children are said to be most common in the summer and autumn, from the temptations to indulge in fruit, ripe, or unripe, in our experience the acute form of gastric remittent is more prevalent about the period of Christmas, when the rich and indigestible fare of this season is partaken to excess by children who are too often encouraged by the foolishness of friends. The same symptoms again often arise when there has been no error in diet, but where digestion has been suddenly checked by exposure to cold or wet, or by some violent exercise or passion of the mind, soon after a hearty meal. The attack in these latter cases is even more sudden than in the former, for even where the illness may clearly be traced to some gross error of diet, the symptoms of fever often come on more slowly. In the instances in which the fever runs the shortest course, and the symptoms are subdued, and the child restored to health in a few hours, the stomach alone seems to be affected. In the more protracted forms, the intestinal canal through its whole extent is more or less involved. In the complicated cases the irritation of the surface proceeds a stage farther, and there is ample reason

to conclude that gastric inflammation has been excited. Whether this is a superadded affection, often the result of improper treatment, or merely an advanced stage of one and the same disease, is a question about which there will probably be a diversity of opinion.

III. DIAGNOSIS.

We have observed that gastric remittent fever in its simple form becomes dangerous, rather from the complications with which it occasionally becomes involved during its progress, than from the actual severity of the disease itself. Whilst it is important to recognize such complications in their earliest onset, we must not forget that it is equally important not to confound the primary and secondary diseases, and that there are some affections which, though sometimes co-existent, are often through mistake considered as the primary or sole existing disease.

The presence of *worms* in the intestines produces some symptoms which to a certain degree resemble those of the remittent fever. At one time the complaint was generally supposed to depend upon this cause entirely; hence the appellation *worm fever*. Dr. Butter exposed the fallacy of this theory, and went so far as to declare, that so far from worms producing this fever, or many of the other serious maladies which have been ascribed to their irritation, their presence in the intestines was at least harmless and probably salutary, producing by their irritation an increased peristaltic action, by which the offensive matter which formed their pabulum was more expeditiously removed. Without going so far, we agree with Dr. Butter, that the mischief from worms in children has been considerably overrated, and that much harm has sometimes arisen from the use of, and perseverance in, the more violent anthelmintics. Picking of the nose and lips, wasting of the flesh, pale countenance, enlarged abdomen, irregular appetite, coated tongue, with fetid breath, and unhealthy, dark, and slimy evacuations, would lead a practitioner, and even an unlearned nurse, to suspect the presence of worms. In these we recognize many of the symptoms of the infantile remittent fever; but there is no fever, especially with remissions, accompanying the presence of worms. There are also other points of distinction in vermination, such as itching of the anus, occasional voracious appetite, grinding of the teeth, and gnawing pain in the stomach. Neither is the emaciation so rapid or so great; and though there may be now and then flushing of the face, the flush is partial, and often confined to one cheek: the peculiar condition of the urine before noticed is also absent in simple cases of worms.

The frequent hacking cough, with fever in some respects resembling hectic, might lead to a difficulty in distinguishing gastric fever.

The occasional existence of tubercles in the lungs, in every stage of disorganization in young children, and even in the unborn fœtus, though more rare than in adults, has been most clearly proved: when there is superadded to the remitting fever of the real hectic the peculiar *picking* propensity, many might be led to fix upon the bowels as the sole source of irritation; but we have often seen cases where, though the picking was strongly marked, there was no intestinal irritation, the lungs being the seat of extensive disease. In the protracted forms of remittent fever, especially in scrofulous constitutions, tubercles in the lungs are very apt to form or be called into action, and lead to a fatal termination. It is of course highly expedient to recognize their presence and the progress of disorganization; in modern times mistakes are less likely to occur, if auscultation be resorted to in doubtful cases. Besides this, the presence or the absence of the depraved and fetid evacuations from the bowels, the enlarged abdomen, the coated tongue, and other signs of intestinal disorder, will guide our opinion; but it is on the signs conveyed by percussion and auscultation that we can best depend for an accurate diagnosis.

Tabes mesenterica, which forms one of the most common complications, and is often produced by the irritation in the mucous membrane of the bowels, which takes place either in the course of the disease, or as the result of improper treatment, is also more frequently confounded with the chronic form of gastric fever than perhaps any other malady. The features of resemblance are, however, sufficiently distinct to enable us to distinguish between them; but we must not fail to remember that the two diseases often run their course together, especially in children of the scrofulous diathesis. Of course when this occurs, the concurrence of the blended symptoms will give us a correct view of the case. In mesenteric disease we find wasting, "but it is slow and regular, not variable and rapid as in bowel-complaints." (*Evanson* and *Maunsell* on the *Diseases of Children*, p. 294.) The appetite is voracious, the abdomen enlarged and hard, and in the advanced stages enlarged veins may be seen meandering over the surface. The enlarged glands of the mesentery may be generally distinguished by manual examination of the umbilical region, and it is rare to find instances where other glandular enlargements, chiefly in the groins and the neck, do not take place at the same time. To these signs we may add the occasionally griping pain about the navel, increased by *deep* pressure, with the regular recurrence of dull pain in the abdomen, lasting often for three or four hours, and accompanied with a sensation of sickness on pressure. There is generally a permanent rapidity of the pulse and hectic exacerbations, but no regular remitting paroxysms, and no picking. The appearance of the dejections is also peculiar, differing from those in the remittent fever in many remarkable points. The motions in mesenteric disease are white and chalky, or dark and ochry, or even blue or gray, but rarely fetid or

slimy, and not tinged with either yellow or green bilious matter. They generally appear altered by the omission of some of the usual ingredients of healthy feces, and not by the excess or addition of depraved matters.

Most authors have particularly dwelt on the diagnosis between *hydrocephalus* and gastric remittent fever, and certainly it is of great consequence that no mistake should arise in confounding the one with the other, as it might lead to a fatal error in the treatment. In the acute forms of either complaint the mistake would be very unlikely to take place, and, therefore, the question of their diagnosis need not occupy our attention. In chronic remittent fever, the child is so often reduced to an excessive state of exhaustion and emaciation by what is called *bold* treatment, that it is not uncommon to meet with the train of symptoms resembling the hydrencephaloid affection described by Drs. Gooch and Marshall Hall; and as the size of the head remains stationary, whilst the neck, body, and limbs waste, the deceptive appearance of enlargement of the head is often given. In scrofulous constitutions we may often meet with real cerebral disease, especially of that form called tubercular meningitis, where tubercles are developed in the substance of the brain itself, during the protracted course of remittent fever. When we consider also how constantly disordered states of the digestive organs produce functional disturbance of the brain, it will be easy to suppose that disease of structure would be likely to follow. We here meet with the chief difficulties, because, whilst the occurrence of cerebral symptoms is to be watched for, guarded against, and properly treated, we must not neglect the condition of the digestive organs as the original seat of the mischief, and the cause perhaps of the complications. The drowsiness and stupor which are sometimes found accompanying simple remittent fever, both during the paroxysm and in the stage of remission, are different from similar symptoms arising in cerebral disease, as there is always a readiness to be roused, no affection of the pupil, and no strabismus. The head also is not, whilst the abdomen is, the hottest part of the body, and there is no convexity of the fontanelle, distension of the veins of the scalp, or peculiar expression of countenance, which denote the chronic forms of affection of the brain and its membranes. When we take into consideration also the absence of convulsions, of obstinate constipation, suppression of the urine, and the other more decisive proofs of effusion, and moreover, reflect on the symptoms which characterize the true gastric remittent fever, the two diseases can scarcely be confounded.

IV. TREATMENT.

Keeping in view the usual exciting causes, if we are called to the patient sufficiently early, and especially if there be sickness, an

emetic of ipecacuanha will be advisable, the action of which may be encouraged by warm diluent drinks. This will sometimes dislodge the offending mass, at once relieve the symptoms, and the child will fall into a placid sleep; the next morning, however well the child may appear, it will always be proper to administer an active purgative, either of calomel with jalap or scammony, or a dose of castor oil, salts and senna, or rhubarb and magnesia, proportioning the dose to the age of the child. Should the time for an emetic have gone by, from the number of hours which have passed before our assistance is required, we may begin at once with the purgatives, but then it will be generally found necessary to give the calomel alone in the first instance, on account of the irritability of the stomach rendering it difficult for the child to retain medicines which are nauseous or in large quantity, but following it up a few hours after with some other purgative. Enemata may be conveniently employed should this irritability of the stomach, or the obstinacy of a young child, interfere with the administration of ordinary purgatives. A warm bath should also be used, particularly if there be much restlessness, or, should this be inconvenient, the feet and the abdomen may be fomented. Effervescing saline draughts, or a few grains of nitrate of potass in solution, or some of the nearly tasteless neutral salts, such as the tartrate or phosphate of soda, may be given at intervals in lemonade or barley-water. The room should be kept perfectly cool and still, the light should be excluded, and the patient supplied frequently with cooling drinks. The removal of the contents of the alimentary canal is generally followed by a subsidence of the febrile paroxysm; as long, however, as the stools are fetid and unhealthy, the patient will be liable to a recurrence of the fever, and the abatement of the symptoms will not be complete. If the last evacuation appear healthy, with due admixture of bile, we may leave the patient at rest for a time. In the interval great care must be taken that the nourishment given be entirely fluid, and of such quality as to be unirritating and easily assimilated; barley or grit gruel, weak broth, arrow-root, or rennet whey, will be the safest articles of food. If the dejections continue healthy, there will probably be little or no return of fever, and it will be only necessary to take care that the child resume its usual habits and its ordinary diet with the greatest caution. Should, however, the regular remissions of fever supervene, it will be requisite, on the recurrence of the paroxysm, to resume the treatment. It is not uncommon to find the bowels exceedingly obstinate, so that very large doses, or a frequent repetition of purgatives, is required to expel the acrid ingesta.

It is always necessary to inspect the evacuations, instead of trusting to the report of the nurse. The state of the abdomen on pressure, as to fullness and hardness, must be also attended to, and we should closely watch the indications of pain or tenderness. The fullness and hardness, distinct from collections of air, which are

easily detected by percussion, will denote the necessity of following up the use of active purgatives, which may be continued at sufficient intervals, so as not to harass and exhaust the patient, till we are satisfied that the intestines are emptied. The signs of tenderness on pressure should lead us to be very cautious in the exhibition of irritating purgatives; castor oil or the neutral salts will perhaps be the safest, and the calomel may be combined with extract of henbane or hemlock, and given in smaller doses at shorter intervals. The abdomen should now be fomented, and if the pain increases and becomes constant, and the febrile symptoms more permanent, there will be no doubt as to the propriety of applying leeches, which we have found more salutary than general blood-letting. The number of leeches, and the repetition of them, must of course be adapted to the strength and age of the child, as well as to the severity of the symptoms. Many have urged that the disease is so exhausting and so liable to be protracted, that abstraction of blood should be avoided; but it will generally be found that active treatment, pursued judiciously in the early and acute form, will be most likely speedily to arrest the symptoms, and prevent the exhaustion consequent upon the more protracted or chronic form. As the symptoms subside, smaller doses of the remedies recommended may be employed; at more distant intervals, and when the secretions have become healthy, the tongue clean, and the fever subsides, it will be sufficient to give a gentle dose of rhubarb with magnesia or sulphate of potass every other day. At this time the power of the digestion may be assisted by a light vegetable bitter, with ammonia or the other alkalies, twice or three times a day; and we have much confidence in the mineral acids, and especially in Meynsicht's vitriolic elixir (an imperfect ether, formerly much in repute in atrophy and consumption), in doses of from five to thirty drops, according to the age of the child. As the appetite returns, the diet may be slowly and cautiously improved; but it must be always recollected that the slightest excess or carelessness, or any neglect in the management of the bowels, will be likely to be followed by a relapse.

II. CHRONIC INFANTILE REMITTENT FEVER.

I. SYMPTOMS.

The chronic form of infantile remittent fever either succeeds to an acute attack, or begins in a more slow and insidious manner, after a longer continuance, or a succession of causes similar to those which induce the acute form. Long habits of indulging in improper articles of diet, swallowing food rapidly, and consequently without due mastication, carelessness and neglect in the

management of the bowels, and perhaps exposure to an impure, damp, or cold atmosphere, and insufficient exercise, are the most frequent causes of this form of gastric remittent fever. Dr. Butter (*op. cit.*, p. 33) is of opinion that both forms of the disease are occasionally epidemic and even contagious: there are certain seasons, as before mentioned, at which it is more prevalent, from circumstances incidental to the period of the year, rather than from any state of the atmosphere; we have never met with instances where it could fairly be considered contagious, and we believe that this doctrine is now exploded. This form of gastric fever is frequently observed to follow many of the ailments to which early childhood is liable, such as hooping-cough, measles, scarlet fever, or accidental attacks of diarrhœa from dentition, &c., chiefly perhaps, because in the course of such diseases, the digestive functions are often much deranged, and in the anxiety to restore strength, nourishing diet is too early and too abundantly supplied.

The symptoms resemble those of the acute variety, except in intensity; some are less severe, others more marked. The paroxysms of fever are less intense, but they last longer, and in the intervals the child is less free from irritation: there is not, perhaps, so large a collection of solid fecal matter in the intestines, and the offensive smell is less striking, the dejections having rather a faint odour; but there is often diarrhœa, and the colour of the motions, whether spontaneous or resulting from medicine, is as unhealthy, often very dark or clay-coloured, or resembling thin mud. The abdomen is hot and tumid from flatulence, the tongue loaded with a dirty fur, the edges often red and dry, but becoming more moist, though not cleaner in the remission; the teeth are often covered with sordes, and the lips parched; the skin feels harsh, and from the rapid wasting hangs in wrinkles about the limbs: in very protracted cases the child has the appearance of shriveled old age. The urine is scanty and high-coloured, with much white sediment, especially during the remissions; the breath is either very offensive or has a peculiar faint odour; there is generally also frequent hacking cough, and in a remarkable degree the propensity to picking before mentioned, not however confined to the lips, eyelids, nose or fingers, but the child picks every part of the body, the bedclothes, and even the face of the nurse. If there be an accidental pimple on the skin, that will usually become the favourite spot to be picked, and sores are often produced, the edges of which are still more eagerly attacked, so that the fingers are constantly strained with blood. This picking is by many considered one of the most conclusive signs of the genuine disease; we have, however, met with two cases, in which it was a very prominent symptom, though the patients had no particularly disordered condition of the digestive organs, but died from empyema supervening or following hooping-cough complicated with pneumonia. As this picking becomes so intense, in what Dr. Underwood by his description

considers the infantile *hectic* fever (which is only the advanced stage of the chronic remittent), perhaps it may be ranked as a symptom belonging to the hectic of children, whether produced by intestinal or pulmonic or other organic disease. In the advanced stages the fretfulness of the child is often most distressing, or sometimes it lies for hours taking little or no notice of anything, and either apparently dozing with half-closed eyes, or when roused immediately resuming the incessant picking. At this period the appetite is very often craving, and the child evinces great irritation and distress on being denied food. In other cases there is urgent thirst, but the appetite is lost; in others again there is neither appetite nor thirst, so that there is great difficulty in getting the child to swallow anything, from its dislike to be disturbed. In the still more severe cases there is generally some complication, either diarrhœa or dysentery, when the mucous lining of some portion of the intestines is found either softened, abraded, or the intestinal follicles enlarged and in various stages of ulceration. It is still more common to find that mesenteric disease is excited by the extension of the irritation to those glands; when this happens the abdomen is hard and tumid, and the enlarged glands may often be felt through the parietes of the abdomen. This complication is more apt to occur where there is a scrofulous taint, and in such constitutions tubercular disease in the lungs occasionally supervenes. Instances of death without one or other of these complications are rare; and even when the child appears to be reduced to the lowest degree of emaciation and debility, by proper treatment recovery may be effected.

II. TREATMENT.

The remedies for the chronic form of gastric remittent fever are to a certain extent necessarily similar to those which have been recommended in the acute. It is not an uncommon mistake, however, to employ too active measures, and especially to administer, almost daily throughout this more protracted disease, acrid purgatives, and even large doses of calomel, by which not only the irritation of the mucous membrane is aggravated to a fearful extent, but the more fatal complications already enumerated are frequently induced. It is not at all unusual to meet with instances where purging is pushed so far, that a fatal dysentery is the consequence, characterized by dejections of bloody mucus, or of fibrin assuming the tubular mould of the intestines. In other cases the inflammation terminates in softening, abrasion, or ulceration of the mucous membrane, and there is also reason to suppose that mesenteric disease has been excited or accelerated by this abuse of purgatives. One would suppose, by the directions often given by practitioners, that it was impossible to purge or starve too much in these cases;

but it is chiefly under such treatment that we meet with those examples of extreme emaciation and lingering disease, in which the constitutional powers are either destroyed, or death ensues.

If, in the first instance, we have reason to suspect accumulation in the intestines, an active purgative, containing calomel, may be safely and advantageously administered; nor is there any objection to have such more powerful medicine occasionally repeated, especially if, by any error of diet or negligence in the management, a relapse or an increase of the symptoms has taken place. But after the purgatives have sufficiently cleared the bowels, the secretions will be best improved by milder remedies: mercurials in gentle doses, especially the hydrargyrum cum cretâ, or calomel rubbed down with chalk, should be given every night, or every other night. A combination of the mercurial with a diaphoretic, particularly ipecacuanha, or, if much restlessness, with Dover's powder, will be found very useful. A mild purgative on the following morning, such as castor oil, compound decoction of aloes, rhubarb and magnesia, or rhubarb with sulphate of potass, will be necessary. Denman, Underwood, Butter, and Pemberton have all spoken highly of this latter preparation, considering it peculiarly adapted to meet the indication, by relieving the fever, improving the secretions, and quickening the action of the bowels and kidneys. The quantities must, of course, be adapted to the age and strength of the patient, but from two to three evacuations will be desirable daily; a larger number will exhaust the child, and fewer will scarcely keep the bowels sufficiently free from offending matters. Saline medicines at intervals will be also beneficial; and the addition of henbane, hemlock or lettuce has been found, by most practitioners, to allay the general irritation, compose the restless distress of the child, and render the action of the remedies more genial. Frictions with oil over the abdomen, or of slightly stimulating lotions, will often be of use, and we have especially observed advantage from the nitro-muriatic acid largely diluted. A nightly warm bath should not be omitted; it promotes perspiration and relieves the mucous surface, besides composing the child and contributing to its comfort.

The diet during the early treatment should be such as will most easily assimilate, and will be least likely to produce irritation, if only partially digested; for this purpose we may allow chiefly barley-water, rennet whey, thin arrow-root, or other farinaceous gruels, and weak chicken or veal broth. When there is thirst, soda-water, or toast and water, or slightly acidulated beverages may be taken.

It is not only that the secretions are unhealthy, but the digestive functions seem entirely suspended in this disease; so that, as Dr. Pemberton has remarked, the food is often passed through the bowels, either unchanged or converted into a putrid mass, as if it had been merely subjected to heat and moisture, and not to digestion. On this account, as soon as the febrile symptoms have sub-

sided, the tongue has begun to clear, and some portion of healthy bilious or feculent matter passed from the bowels, we may commence very cautiously the use of such means as will gradually restore the tone of the stomach and bowels, as well as improve and remove the unhealthy secretions.

In the more early stages of improvement, we have found the mineral acids, upon the whole, the safest medicines for this purpose. The infusion of roses may be conveniently employed, and it will be easy to add some of the neutral salts, with which sulphuric acid is not incompatible, to answer the other indications required. Nitric acid or chlorine, by acting perhaps upon the liver more than the other acids, may be in some respects preferable. Meynsicht's vitriolic elixir has also with much justice been praised. The vegetable bitters combined with rhubarb or aloes, and some alkali, may in some cases be given at an early period; but great caution must be used, as a too early recourse to tonics may renew the accessions of fever, with the whole train of disordered actions. As convalescence advances, more decided tonics may be tried, such as bark, quinine, or the preparations of iron; but it will still be advisable to give occasional doses of aperients, and perhaps also of mercurials.

The gradual improvement of the diet may keep pace with the trial of the tonics and the renovated power of the stomach; but extreme caution is necessary in this respect, both as to the quality and quantity of the food. A larger meal than usual, even of the safest description, is often followed by a serious relapse; while premature indulgence in more solid diet, or the least carelessness as to the indigestible nature of it, will at once undo all that has been effected towards recovery. For many weeks after convalescence has apparently been established, this cautious restriction is advisable; and the injudicious pampering by parents and friends, under the pretext of strengthening the poor debilitated child, becomes one of the most frequent causes of ultimate disease. In the stage of convalescence the skin should be guarded from damp and chills, a very ready source of derangement of the digestive organs, whilst pure air, well-ventilated apartments and tepid bathing are valuable auxiliaries. The advantage of change of air is great. Dr. Evanson indeed remarks that, "through the whole management of remittent fever, nothing is more remarkable than the benefit derived from the latter source (change of air): we have frequently seen a patient who had been several weeks labouring under the disease, enjoy tranquil and refreshing sleep the night after his removal to a distance of three or four miles from his ordinary abode."

CHAPTER IX.

HECTIC FEVER.

[Syn. Ἑκτικη; *Febris hectica, F. Amatoria, F. lenta, F. Ampherina hectica, Atrophia, Epanetus hectica; Fièvre hectique, Fièvre lente,* Fr.; *Etica Febbre,* Ital.; *Das Schleichendes Fieber, Hektiches Fieber,* Germ.]

Hectic Fever, so named on account of its continuity and inveteracy, (from the Greek adjective, ἑκτικὸς, habitual,) has been arranged by not a few pathologists among Primary Fevers. The soundness of that arrangement, however, will scarcely be admitted in the present day; for it seems well-established, that true hectic occurs only in connection with serious organic alterations of structure, and seldom unless where suppuration exists. It is only by extending inconveniently the meaning of the term hectic, this affection can be viewed as primary in its nature.

As generally understood by British practitioners, it may be defined—*A form of remittent fever of long and indefinite duration, consisting of an exacerbation once or sometimes twice a day, attended with extreme attenuation of the body, and depending either on suppuration or upon important organic derangements of structure.* Some modern authors, and among these M. Broussais, the latest writer who has written expressly on the subject, have adopted a much more comprehensive definition, according to which "hectic consists of a slow continued fever of long and indefinite duration, and attended with debility and emaciation." This definition has been adopted, as appears from the writings of the last-mentioned author, in order to include what has been more recently characterized, especially in this country, under the name of irritative fever, and which it is important to distinguish from the true hectic of existing nosologists.

I. SYMPTOMS.

The symptoms of hectic fever, when it is fully formed, are very characteristic. Like other fevers it is obscure in the beginning, and can scarcely be distinguished from the febrile state at the commencement of continued fever, or that which attends some chronic internal inflammations, chronic visceral derangements of structure, and gastro-intestinal irritation. The pulse is generally frequent, varying between 90 and 120—always irritable, so that slight sources

of excitement increase its frequency—and usually small, jarring, yet compressible. Irregular exacerbations occur, preceded frequently by chilliness, attended with heat of skin, some flushing of the features, and a burning sensation in the palms and feet, but not always followed by perspiration. Although the exacerbations occur irregularly upon the whole, they are observed to be most frequent after meals, especially breakfast, and to recur very regularly in the fore part of the night, at which time the paroxysm is generally greater than at any other period. The digestive functions are at this stage not unfrequently, yet by no means invariably disturbed, the tongue being loaded, the stomach weak and the bowels subject to constipation. There is always much debility; and the emaciation is commonly great in proportion to the amount of fever and other functional disturbances—although some remarkable exceptions are observed to this rule, even in that most unequivocal of all forms of hectic which attends pulmonary consumption.

The disease continuing to advance along with the progress made by its fundamental cause, its characters gradually become more strongly marked and diagnostic. The irregular febrile paroxysms gradually pass into a continual state of excitement of the pulse, with a regular exacerbation of fever occurring at least once and often twice in the twenty-four hours, usually at the same periods of the day. The principal exacerbation commonly begins towards evening, reaches its height about midnight or a little later, and goes off early in the morning. Cullen held that another exacerbation in the forenoon was an essential character of hectic fever. This, however, is a mistake, into which he was led probably by his erroneous physiological belief in a double diurnal revolution in the rate and excitability of the circulation in the healthy state of the body. There is no doubt that a secondary exacerbation often takes place during the forenoon in hectic fever. But in very many cases no such incident is observable; and in many others where it does seem to occur, the exacerbation is not essential, but incidental merely, and nothing else than an increase of that diurnal *febricula* or excitement, which takes place in many irritable habits in consequence of the digestion of the meal of breakfast.* In some

* The doctrine of Cullen and other physiologists, that the healthy circulation is subject to a double diurnal excitement, and that the chief period of excitement occurs in the evening, was first disproved by Dr. Knox in 1816. He found that there is only one diurnal revolution, independently of incidental excitements; that the pulse is more frequent and excitable in the morning on awaking, gradually becomes less so towards evening, and acquires its greatest state of depression about midnight or before going to sleep. The writer having, in ignorance of these investigations, made some experiments of the same nature a few years afterwards, he can confirm the results at which Dr. Knox arrived, except that, instead of observing actual excitement of the pulse in the morning, he found only very marked excitability. Under a careful avoidance of all accidental stimuli, such as food, exercise, mental excitation, and the like, he found no difference whatever either in the pulse or animal heat in the course of the whole day and night; but on awaking in the morning there was so great excitability, that trifling

instances where only one distinct exacerbation occurs, it is observed to take place, not during the night, but in the forenoon between ten and four; which, however, is a rare circumstance. The paroxysm or exacerbation of hectic is essentially a paroxysm of remittent fever. The cold stage is often wanting, especially when the disease is fully formed. The hot stage is almost invariably followed by considerable perspiration, unless means be taken to prevent it. The interval is generally one of remission merely, the pulse continuing frequent. But sometimes there is an intermission as complete as in the most characteristic case of ague; and although the pulse in the interval may be frequent, the animal temperature is often not above the healthy standard.

In hectic fever the appetite and digestion, though frequently disturbed in the early stage, are for the most part entire when the disease is fully formed, and accompanied with a clear, moist, reddish tongue; but at a later period the stomach often becomes again irritable, vomiting of food is common, and the tongue and fauces are often tender and covered with aphthous ulcers. The thirst is seldom urgent; the urine usually high-coloured and sedimental; the skin soft, delicate, and easily excited to perspiration; the bowels regular or inclined to constipation. Diarrhœa is often considered a symptom of advanced hectic; but it is not essential, and occurs only when inflammation and ulceration of the bowels arise secondarily to the primary cause which occasions also the hectic itself. There are a remarkable paleness and bloodlessness of the whole integuments, a pearly appearance and want of vascularity of the conjunctiva, blanching, and crookedness of the nails; and during the diurnal exacerbation there is a bright red, almost circumscribed spot upon each cheek, contrasting strongly with the pallid hue of the rest of the body. The debility is commonly great, and always attended with progressive and in the end extreme emaciation. Towards the latter stage œdema of the ankles and even of the legs is not uncommon. The mind is seldom impaired till near the close, when mild delirium sets in. Previously, however, the mental faculties are not merely in general undisturbed, but even in many instances unusually clear and vigorous; and the spirits are upheld by false confidence and hopes of recovery. The duration of hectic is exceedingly various, and chiefly depends on the progress of its fundamental cause: frequently it endures for many months.

stimuli raised considerably the pulse and temperature; after mid-day this excitability gradually decreased: and towards midnight it was lower than at any previous period. It is remarkable, therefore, that the ordinary period of greatest excitement in hectic fever, continued fever, and many other febrile diseases, occurs exactly at the time when there is the least excitement or excitability in the healthy state of the functions.

II. DIAGNOSIS.

The diagnosis of hectic fever is an object of much importance in practice, both directly on account of the disease itself and its treatment, and also indirectly for the sake of the inferences which may be drawn from its presence and absence in various diseases. In some circumstances, for example, the presence of hectic may determine the question of the existence of certain organic disorders; and in others, as in chronic pleurisy, it may point out the pathological termination of the disease and the nature of the fluid effused. Fortunately, it is for the most part easily distinguished from all other fevers, by the characters which have just been given above. With one form only of fever is it apt at times to be confounded, namely, certain varieties of irritative fever, especially those which attend chronic internal inflammations. In such cases, however, the febrile exacerbations, though frequent, are more irregular in their periods than where true hectic prevails; or where a periodicity is remarked, the exacerbations are found to be connected with the excitement incidental to digestion. In irritative fever the febricula of digestion is often much increased, the pulse being raised twenty pulsations or more for some hours after meals, and this state being regularly followed by free perspiration. The same thing is sometimes observed in hectic fever, though seldom so remarkably; and, where it does occur, there is also the regular and proper exacerbation of hectic late in the evening, whether a meal be taken or not. Another circumstance connected with fever, which may occasionally cause deception, is, that sweating often occurs on the patient awaking in the morning. In all states of debility the skin is frequently observed to be bathed in perspiration as often as the patient awakes. But this occurrence is easily distinguished from the sweating of hectic by its happening at all times of the day indifferently, and by the sweating of hectic taking place whether the patient is asleep or awake, and generally indeed before the approach of sleep, in the early part of the morning.

III. CAUSES.

Much vague discussion has arisen, both among nosographists and express authors on hectic fever, as to the causes of this affection. It would be unprofitable to reproduce that discussion here. It is sufficient to observe, that the doubts and differences which have prevailed on the subject seem to have originated mainly in the discrepant statements and opinions of authors respecting the true characters of hectic. If the forms of irritative fever, adverted to a short time ago, are to be considered as varieties of hectic—namely, where exacerbations terminated by sweating occur irregularly, or

present themselves only in connection with the excitement of digestion,—there is no doubt that the causes of hectic are numerous and diversified, and that it might, even with an appearance of justice, be held with some authors to be occasionally a primary disease. But if the characters of hectic be taken as they are commonly understood in this country, and as they have been laid down by CULLEN, then there seems as little room for doubt that the disease originates only in connection with suppuration or serious organic derangements of structure in the internal viscera; so that this character may even be correctly admitted into its definition. By confounding together irritative and hectic fever, some modern authors have been led to extend the causes of the latter affection to an extraordinary degree. Thus M. BROUSSAIS gives illustrations from his own experience, as well as from the literature of medicine, tending to show that hectic may arise from a great variety of gastro-intestinal irritations, such as errors of diet, foreign bodies in the alimentary canal, especially irritating poisons, diarrhœa, and the sequelæ of intermittents—also irritations of the pulmonary mucous membrane from foreign bodies or chronic catarrh—gonorrhœal or leucorrhœal irritation of the mucous membrane of the genital organs—excessive hemorrhage, or suppression of habitual hemorrhagic discharges—protracted lactation—excessive sweating, and extensive chronic diseases of the skin—mental irritation or exhaustion from excessive study, and violent passions—general bodily fatigue—excessive atmospheric heat or cold—and finally from organic diseases of internal organs, and suppuration either of internal viscera, or in other more external parts of the body. Under the direction, however, of a just nosological arrangement and a correct diagnosis, the greater number of these supposed causes must be thrown aside; and the experience of CULLEN is probably that of all his successors, that a hectic fever, such as he describes, is constantly found to be a symptom of some topical affection, most commonly of an internal suppuration.

The most remarkable and characteristic cases of hectic occur along with internal suppuration, such as ulceration of the lungs, consequent upon tubercular deposition, purulent effusion into the chest, the result of chronic inflammation of the pleura, suppurating tumours in the pelvis or abdomen, lumbar abscess and the like. Its symptoms are also usually well-marked where the bones are affected with caries. Its characters are likewise for the most part distinct in malignant diseases, especially scirrhous and fungoid tumours, when ulceration is established. The degree or intensity of the hectic, however, is not always proportioned to the extent of the suppurating surface, the accumulation of pus, or extent of discharge. In malignant tumours, for example, in caries of the bones, and in abscesses formed in the substance of internal organs, the hectic is often intense, though the extent of the ulceration or discharge is insignificant. The usual rule would seem to be, that the

general system sympathizes much less with the extent of the injury than with the importance of the affected organ on the one hand, and with the malignity of the fundamental disorder on the other. Some extraordinary exceptions occasionally occur, as where extensive suppurations form in the liver, or sac of the pleura, or the brain, without hectic fever being produced at all; but such incidents are too rare to affect essentially the general law.

There is likewise no question that hetic fever may be occasioned by serious organic diseases without purulent matter being formed. Carcinomatous affections, for example, sometimes engender all the phenomena of hectic, before they reach the stage of suppuration; and the same is observed to occur in regard to some chronic inflammations, such as chronic pleurisy and chronic pneumonia. In these circumstances, indeed, the exacerbations of fever are most generally irregular, so that the febrile state is rather of the nature of irritative than of hectic fever. But still the symptomatic affection does occasionally put on the characters of true hectic. Hence in chronic inflammations, the advent of hectic fever is not so unequivocal a sign of suppuration having taken place as many practitioners imagine. The writer has repeatedly seen a perfect hectic attend chronic peripneumony and chronic pleurisy, where, on inspection after death, no trace of suppuration was found, but merely general hepatization of the lung in the former case, and sero-fibrinous effusion in the latter. In one of the cases of chronic pleurisy now referred to, the fluid in the chest was evacuated by puncture, in the confident expectation that purulent matter would be discharged; but the only matter which issued was a serum of light density, in which fleecy strings of fibrin formed on standing.

IV. TREATMENT.

The treatment of hectic fever is necessarily in part subordinate to that of the fundamental disease on which it depends. But there are likewise certain measures which may be resorted to for mitigating more directly the severity of the febrile action. The antiphlogistic system is inadmissible except in those cases where the disease is clearly connected with chronic inflammation not in the advanced stage, or where acute inflammatory action, as often happens, is excited incidentally. In the generality of cases, an opposite system is rather called for; and a somewhat generous diet, including nutritive articles of food, and even the moderate use of stimulating liquids, is found to support the strength without increasing the febrile action. In every circumstance, however, the diet should be easily digestible and not too abundant, otherwise the stomach is enfeebled, and the heat and restlessness of the exacerbations increased. Tonics are of little service, except where they may be found applicable to the fundamental disease, or are required to correct the tendency to dyspepsia, which occasionally prevails at the

commencement. In the latter case simple bitter infusions, such as of quinia, gentian, or calumba, with or without the alkaline bicarbonates, are commonly found to answer best. [Quinine may often be administered in hectic fever with great advantage. If the stomach will not tolerate it, the cold infusion of red bark, made by displacement, will be found an admirable substance.] The patient ought to be confined in cold weather to apartments maintained at a uniform and moderate temperature; and at night, when the sweating stage of the exacerbation approaches, the bedclothes should be diminished so far as is consistent with his feelings. In mild weather, however, and in a suitable climate, great advantage is found in persevering with gentle out-of-doors' exercise, as long as the strength will permit. Nothing contributes so much to the patient's comfort, both at the time and for the rest of the day; and, in particular, the restlessness in the evening and the subsequent perspiration are better mitigated in this than in any other way. One of the most important objects of treatment in hectic is the diminution of colliquative sweating. In addition to the means already pointed out for this purpose, it is found that advantage is sometimes derived from the tepid sponging of the head, face, chest, and arms, in the early part of the night before the sweating stage sets in. Of all internal remedies for the same end, none equals the sulphuric acid, which in this way is one of the most efficacious astringent refrigerants. The restlessness and want of sleep must be met with anodynes. These, indeed, are in general rendered also necessary by the cough, pain, or other uneasiness arising directly from the primary local disease. The whole list of narcotics has been had recourse to in such circumstances. Hydrocyanic acid in frequent small doses is sometimes decidedly serviceable; tea is commonly of some use; hyoscyamus, or some of the other solanaceous narcotics, is also often effectual; but the most efficient of all, and that to which all resort, sooner or later, is opium, or a salt of its alkaloid. The great objection to opiates is their tendency to increase the sweating, which the conjunction of sulphuric acid does not always correct. Frequently, however, there is no alternative, as nothing but opium or morphia will obtain sleep or quiet. The compounds of morphia have the same advantage over the Galenical preparations of opium in this as in other diseases. This is not the place to enter into the treatment of the affections incidentally concurring with hectic, and arising secondarily to its fundamental cause. But it may be mentioned, that the best method of counteracting the diarrhœa, which is thus so often associated with hectic, is by the administration of considerable doses of acetate of lead with small doses of opium, such as one or two pills, twice or even three times a day, prepared like the lead and opium pill of the Edinburgh Pharmacopœia. No other treatment is so frequently and so promptly successful in arresting the diarrhœa, or is attended with so little risk of increasing the vicarious discharge by perspiration.

CHAPTER X.

SMALL-POX.

[Syn.—*Variola, Variolæ, Pestis Variolosa; Variole, Petite Vérole, Picote,* Fr.; *Echten Blattern, Natüsliche Blattern, Menschenpocken, Menschenblatternkrankheit, Kinder Blattern, Kinderpocken,* Germ.]

Small-pox may be thus defined:—A fever commencing with sickness, headache, pain of the back, and general lassitude, followed on the third day by an eruption on the skin of pimples, more or less extensively diffused, which in the course of a week inflame and suppurate, accompanied in many instances by a similar affection of the mucous membrane of the nose and mouth; in some by swelling and inflammation of the subjacent cellular membrane, and occasionally by affection of the nervous system. The several kinds of small-pox which have been described by authors have reference, 1, to the nature of the accompanying fever; 2, to the quantity and aspect of the eruption; 3, to the concomitant and superadded symptoms.

The following are the principal varieties of small-pox mentioned by the best authors:—1. *Variola discreta; 2. Variola confluens;* 3. *Variola semiconfluens;* 4. *Variola coherens,* or *corymbosa;* 5. *Variola regularis,* or *benigna;* 6. *Variola maligna;* 7. *Variolæ anomalæ,* under which head are included small-pox with affection of the brain, small-pox with affection of the chest, small-pox with diarrhœa, or dysentery. Small-pox is said to be *distinct* when the pustules admit of being counted, being placed at such distances from each other as not to coalesce, or run into each other, even when fully maturated. It is called *confluent* when the pimples are so close set as to run into each other on the third or fourth day of inflammation. The terms *clustered, coherent,* or *corymbose* small-pox is applied to that form of the disease where the pimples are confluent in patches, the patches being, however, separated by intervals of unaffected skin. Small-pox is said to be *semiconfluent,* when the papulæ are so far separated from each other that they do not coalesce generally until the full period of pustulation.

The phenomena of small-pox, in all its forms and varieties, admit of a natural and useful division into four stages:—The first is the stage of *incubation,* extending from the reception of the variolous germ to the invasion of fever. The second is the stage of initiatory or eruptive fever, occupying three or four days. The third is the

stage of maturation, extending from the development to the full maturation of the pustules, a period varying from five to nine days. The fourth is the stage of decline, desiccation, and *secondary* fever.

We shall begin by detailing the phenomena observable in an attack of distinct but full small-pox, occurring to a young person in the prime of life, unvaccinated, of good constitution, without any peculiarity of temperament, or disposition of blood and humours likely to interfere with or modify the ordinary train of symptoms. This being done, we shall proceed to show what are the characteristics of the other *varieties* of small-pox usually noticed by authors, and the modifications produced in the symptoms by difference of age, habit, previous condition of body and mind, and, lastly, by previously undergoing vaccination.

A. VARIOLA BENIGNA DISCRETA.

I. INCUBATION.

It is observed by Rayer, in his valuable treatise on the *Diseases of the Skin*, that this period (during which the system, after imbibing the variolous germ or poison, is preparing for its elimination) presents for the most part no morbid symptoms either of a general or local nature. The usual accuracy of this author is not well displayed here. The fact is, that a variety of circumstances distinguish this period, commonly known to nurses as the period when the small-pox is *breeding*. In many cases the patient experiences at the moment of imbibing the germ or contagion some disagreeable feeling, such as an unpleasant odour, a sense of giddiness, sickness, or an inward sense of alarm and fright. The succeeding days are passed differently in different cases. Sometimes little or no inconvenience is felt; at times, however, there is present a certain degree of languor and lassitude; the patient is low-spirited, and disinclined to exertion; the nights are restless, and the digestion somewhat impaired. The usual duration of the incubative stage of small-pox is twelve days, but it is difficult to assign the maximum and minimum limit: possibly it may extend from seven to fourteen days.

II. INITIATORY OR ERUPTIVE FEVER.

On the eleventh or twelfth day from the reception of the variolous germ, rigors announce the setting in of the initiatory or eruptive fever. Sometimes one severe and long-continued shivering fit indicates to the practised physician the coming events: at other times the rigors are less violent and recur irregularly. They are soon succeeded by the common evidences of pyrexia:—general pains of the limbs, a quickened pulse, diminished secretion, a hot

skin, with dryness or disposition to sweating. But there are certain other symptoms very characteristic of incipient small-pox. They may be thus enumerated:—severe pain, or weakness as it is sometimes called, in the back, so that the patient has suddenly dropped down. We have known a female attacked about the expected period of parturition with such excruciating pain in the loins, that labour was momentarily expected. It proved to be the onset of severe semi-confluent small-pox.* Frequently the encephalon suffers. There is pain of the head generally, or pain referred to the temples. Among children a state of somnolency is frequently noticed, and they wake with a start or fright. The nervous system sometimes participates in a degree still more striking:—a child is unexpectedly seized with a perfect epileptic paroxysm; the adult becomes delirious, or falls into a state of stupor, and he may well be imagined on the eve of some severe cerebral affection; the face is flushed; the action of the heart is rapid and tumultuous. In some cases the stomach is the organ which first takes alarm from the impending evil. There is acute pain of the stomach present, aggravated by pressure, and accompanied by such incessant vomiting that the physician, not without reason, suspects the presence of gastritis, and directs the loss of blood and the infliction of a blister. The irritable condition of the stomach frequently continues through the whole period of initiatory fever, and is not entirely subdued until the eruption has extended over every part of the surface, even to the legs and feet. In almost all cases there is marked prostration of strength. The expression of countenance is anxious: in some instances, where the habit is weak, there is an almost total collapse. The pulse is feeble, the skin pale, contracted, and cold: wine and cordials are here urgently required to keep the patient from irremediable exhaustion. All these more urgent symptoms, however, indicate, for the most part, the approach of a severer form of the disease than that which we are now describing. The pain of the back and loss of muscular power are the symptoms, from the comparative mildness or severity of which the best prognosis may be formed.

The phenomena now enumerated as the chief features of the eruptive fever of variola may be so variously combined, that it is often difficult to say on which organ or structure the poison has fixed itself in greatest force. Such symptoms may cease altogether with the appearance of eruption, or they may continue to harass the patient, in varying degrees of intensity, through the greater part of the next stage, that of maturation.

The duration of the initiatory fever of small-pox is one of the most important points in its history. By it alone the diagnosis is in many cases accurately established, and it will always attract the

*[Dr. Chomel regards the lumbar pains, which he refers to the kidneys, as pathognomonic of variola.]

especial attention of the physician. It has proved, however, a fruitful source of controversy among authors. Prior to the time of SYDENHAM, it was thought desirable to shorten the period as much as possible, and this was attempted by the employment of heating diaphoretics. SYDENHAM again believed (chap. ii. p. 34) that "the more time nature employed in finishing the separation of the inflamed particles, the greater was the chance of ultimate success in the cure." There is little ground for either opinion. The period of initiatory fever is singularly uniform: in a large proportion of cases the eruption shows itself at the end of forty-eight hours from the occurrence of rigor, pain of back, or sickness, whether the subsequent symptoms be mild or malignant, the eruption distinct or confluent. This period may be lengthened from weakness of habit, the loss of blood, long-continued vomiting, or extreme cold; but, so far as our experience extends, it is never shortened.

The time occupied in the development of the eruption is liable to considerable variety. It is usually completed over the whole body in one or two days, but from accidental circumstances, like those which protract its first appearance, it may extend over a period of three or even four days. In a great proportion of cases the eruption of small-pox develops itself in the following manner:—Minute papulæ, sensibly elevated above the surface of the skin, first show themselves on the face and forehead. It is only in a very few instances that the eruption commences in the inferior extremities: it is seldom distributed in equal profusion over the whole skin. It often happens that one or two papulæ precede the general eruption, and have advanced to the state of vesicle before the surface is extensively occupied.

The sides of the nose, chin, and upper lip, generally display the earliest pimples: then some are perceived on the neck and wrists: by degrees the trunk and thighs are occupied with eruption, the feet being almost invariably the part latest affected. With the completion of eruption terminates the second stage of small-pox, the initiatory stage, or fever of invasion.

III. MATURATION.

In all cases of distinct small-pox, and in a large proportion of cases of the semiconfluent kind, the constitutional symptoms experience a marked relief when the eruption is fully developed:—the pain of the back, the vomiting, and the headache abate, or disappear entirely: the respiration becomes less hurried; the pulse diminishes both in force and frequency; there is less jactitation and restlessness, and not unfrequently the patient gets some sleep.

On examination of the papulæ it will be found (where opportunity is given for observation by the moderate quantity of the eruption) that they are not thrown together confusedly and without order, but that they are arranged in groups of three or five, as-

suming often a crescentic shape. Two or more groups coalescing form, in some cases, a complete circle of papulæ.

IV. ANATOMICAL CHARACTERS OF THE VARIOLOUS VESICLE.

Great attention has been paid by modern authors to the anatomy of the skin under small-pox. Cotugno commenced the investigation, which has since been diligently followed up by John Hunter, Dr. Adams, Mr. Cruikshanks, Dr. Craigie, and various continental authors, more especially Dr. Petzholdt. A full account of the latest views on this subject may be found in the *Brit. and Foreign Med. Rev.*, vol. v., p. 470.

The following is a brief sketch of the opinions now entertained as to the structure of the variolous pock. The inflamed spot (*phlyctidium*) has its seat in the cutis vera. It commences on a central point called the stigma, spreads by radiation on the surface, and penetrates in different cases to a greater or less depth. Beneath the epidermis, and constituting the greater part of the phlyctidium, is found a substance of a consistence like pulp or thick mucus—a sort of pseudo-membranous layer, or disc, which is not considered as any part of the skin itself altered by disease, but as a new product. This substance was known to John Hunter, by whom it was called the variolous slough. The vesicle, when further examined, is found to be divided into numerous cavities or cells: it is multilocular. The floor of each phlyctidium presents the papillated structure of the skin elevated and marked with fissures and chinks. At the height of suppuration this part is swelled, and moist like a sponge. The fluids, (lymph and purulent matter,) which at different stages of its course distend the cells of the phlyctidium, are thrown out by vessels which shoot from the red central point or stigma. This point may readily be detected on the vesicles of the face and trunk (at least on the greater portion of them) by a depression on the surface of the vesicle, where the chorion and epidermis adhere. This central depression, abundantly obvious in most cases to the naked eye, is in an early stage of the disorder made more manifest by the microscope. It gives that peculiar umbilicated form to the variolous vesicle, which is the great characteristic of small-pox.

The inflammation of the phlyctidium is accompanied by an *areola* or halo of a damask-red colour, more or less vivid according to circumstances, and which extends to some distance beyond the margin of the vesicle. The secreted fluid, at first thin and limpid, distends in the first instance, and elevates above the level of the surrounding skin the sides of the vesicle. At length the filamentous attachment of the stigma to the cuticle is destroyed, the central depression ceases to be observed, the pustule acuminates and ultimately bursts, discharging a well-formed purulent matter of the consistence of cream, and of a yellowish colour.

Leaving these anatomical minutiæ for matters of more direct practical application, it may be observed that the maturation of each individual phlyctidium occupies, in the class of cases now under consideration, (the regular distinct benignant,) a period of seven days. It is seldom, however, that the condition of the eruption is uniform over any large extent of surface. The pustules on the face and neck usually attain their proper size, and discharge their contents first, then those of the trunk and upper extremities, while the parts at a distance from the centre of circulation are slow in reaching maturity. Three, four, or even five days, therefore, may intervene between the period when the pustules begin to burst on the face and the perfect maturation of those on the feet.

The constitutional symptoms present during the period of maturation (or concoction) vary greatly in severity. When the pustules are numerous, there is both general fever and local irritation; the pulse is accelerated; the nights are restless; the urine is scanty and high coloured; frequently there is delirium, especially at night. Much, however, will depend on the quantity of eruption, the habits of the patient, and the circumstances under which he is placed. If the habit of body be good, the blood of healthy quality, without plethora; if the season be mild, the apartment cool, and the diet carefully restricted; if, lastly, the mind of the patient be tranquil, a large mass of eruption may maturate with a very moderate degree of fever. In many cases, however, there is great local irritation; the skin is often so tender as to occasion the utmost distress; frequently there is great itching of the surface, so that the patient is with difficulty restrained from scratching and abrading the tender vesicles; the face is often swelled, and the eyelids closed during the three or four days which precede the bursting of the pustules. A similar swollen condition of the hands is often productive of great inconvenience. Throughout the whole period of maturation, but especially at the height, the surface of the body throws out a peculiar faint and sickly smell, quite peculiar to this disease.

V. DESICCATION AND DECLINE.

On the eighth day from the appearance of eruption, the inflammatory areola subsides, and the ripened pustules having burst and discharged their contents, are succeeded by scabs which dry up and, in a healthy state of constitution, fall off in the course of four or five days. In mild cases, where the full process of pustulation is not gone through, many of the vesicles become shriveled, and form only imperfect and scaly crusts. Occasionally these imperfect scabs may be seen intermixed with the scabs of well-developed pustules; and it often happens that, on the lower extremities, this premature desiccation of the vesicles shall be very general. The phenomenon has been attributed almost universally to the absorption of the

purulent matter. But it is not so. No matter is formed: the serous fluid secreted during the first days of inflammation does not undergo any further change; it condenses in the serous form; the cuticle over it shrinks; and in this manner a dry scaly crust is formed. About the fourteenth day of eruption, the fever has entirely subsided, all swelling of the face has ceased, the crusts have fallen from the face and upper parts of the body; but the surface of the skin, especially of the face, is left of a reddish brown or vinous tint; and occasionally, where ulceration has succeeded the bursting of the scab, depressions are perceived. The clarety hue of the skin left by small-pox often continues for many months. The pits or depressions (*foveolæ*) are permanent in after life. From the great vascularity of the face, there is always most risk of such disfigurement in that part.

B. VARIOLA CONFLUENS.

The extraordinary difference between the distinct and confluent forms of small-pox have been observed by all authors since the disease was first an object of study. It is not merely that the skin is here more crowded with papulæ, but other features of the complaint are observable, which in the distinct form are absent or scarcely perceptible. The following brief enumeration of the peculiarities of the confluent small-pox will prepare the way for that more detailed investigation which the importance of the subject demands: 1. The eruptive fever is more intense. 2. The regular course of inflammation in the vesicles is interfered with by the immense quantity of papulæ which occupy the skin; the inflammation extends to the subjacent cellular texture. 3. The mucous expansions of the nose, mouth, pharynx, larynx, and trachea, are the seats of eruption equally with the skin; and this complication materially influences the progress and appearances of the cutaneous inflammation. 4. The nervous system participates in the general disturbance. 5. The febrile symptoms continue, and even increase in intensity, from the first appearance of eruption to maturation. 6. The decline of the disorder is accompanied by *secondary fever*.

1. In confluent small-pox the eruptive fever is for the most part very severe: the pain of the back and muscular weakness are excessive; the patient staggers in his walk; the expression of countenance is haggard; at times there is, from the very first, a strongly marked implication of the brain and nervous system; delirium is observed, sometimes fierce, sometimes of the typhomaniacal character, or the patient is comatose; the respiration is laborious; the pulse frequent, small, contracted, or oppressed; and there is constant sickness at stomach. Sydenham (sect. iii. chap. ii.) and other authors have described confluent small-pox as ushered in with

diarrhœa, and general irritation of the mucous membrane of the alimentary canal: we have rarely met with this occurrence.

2. The immense number of papulæ thrown out on the surface is undoubtedly the leading feature of confluent small-pox, and one great cause of danger. The extreme vascularity of the face leads often to confluence there, while other parts may be comparatively free. Still the disease is called confluent, and the progress of eruption on the face becomes the index which chiefly guides the judgment of the physician. Sometimes, however, confluence is confined to one arm, to one leg or foot, or to the breast. These cases are comparatively much less dangerous.

In all cases extreme confluence interferes materially with that due progress of cutaneous inflammation, on which the safety of the patient mainly depends. There is no areola, no central depression. As early as the third day, the face appears covered with a thin cutaneous whitish pellicle, a kind of membranous exudation similar to that which is observed at the bottom of isolated pustules. The inflammatory action thus checked in its regular course, dips inward, and invades the subjacent cellular membrane. The face and head about the third day begin to swell; the salivary glands become involved, and ptyalism sets in, which often continues until the eighth or tenth day. The cellular membrane throughout the body generally, participates (more or less, according to the number of the papulæ on the surface) in the same affection. There is tension of the limb, often to a great extent, and an erythematous redness occupies such parts as are free from papulæ. In some aggravated cases buboes form in the groin with intense pain. The scalp is often very tumid, a symptom from which much danger is to be apprehended. Phymosis and paraphymosis, and a swollen state of the scrotum, are attributable to the same general condition of the body. The face about the eighth day presents the appearance of one flat and doughy sore, which discharges a copious thin ichor. An intense pruritus accompanies the formation of the scabs, which often induces patients to tear themselves with their nails. In children especially this is noticed, as the numerous black, bleeding, and excoriated points observable on the face amply testify. Very many patients die between the eighth and twelfth day of the eruption, from the combined effects of cutaneous and cellular inflammation.

3. In almost all cases of confluent small-pox there is an affection of the mucous tissues, which adds largely to the danger. This inflammation of the mucous membranes constitutes an important element in the character of variola, and will require separate examination. The mucous membrane of the nose, mouth, pharynx, larynx, and trachea, are the parts thus affected; the tongue is also implicated; papulæ show themselves on these parts simultaneously with the cutaneous eruption. The mucous vesicles may be distinct, confluent, or semiconfluent; they run the same course as the cuta-

neous vesicles, coming to maturity, like them, on the seventh or eighth day. The symptoms occasioned by this mucous affection are as follows:—Numerous white points appear on the tongue, palate, and velum pendulum; the membrane of the mouth is red and injected; there is a distressing heat in the mouth, difficulty of swallowing, pain in the throat, sense of stuffing in the nose, hoarseness, and cough; the occurrence of hoarseness marks the implication of the larynx, and its increasing severity may be taken as a just index of increasing danger; the cough is first dry, hard, painful, and tearing; as the disease advances, it is accompanied by mucous expectoration. About the eighth day, a copious viscid secretion takes place from all the affected structures; but in a large proportion of such cases the swelling has by this time extended to the parts about the larynx, and the effused fluids have so blocked up the trachea and air-passages, that respiration is materially impeded, the due oxygenation of the blood interrupted, and suffocation threatened. The progress and aspects of the cutaneous eruption are necessarily modified by the mal-oxygenation of the blood; the areola, on parts at a distance from the heart, is either altogether wanting, or is of a clarety or livid colour; the pustules are everywhere flat;—they do not fill or acuminate well, even on the neck and breast; the extremities are cold; the tongue is swelled, and of a purple hue. In addition to the increasing dyspnœa, a low muttering delirium is observed, at first present only at night, afterwards permanent through the day; restlessness and anxiety increase; and between the eighth and tenth day from the first appearance of eruption, the patient dies.

4. In a certain proportion of cases of confluent small-pox the brain and nervous system are implicated in a degree far beyond what the general febrile disturbance would seem to warrant. From the first there is delirium, of that kind called by the old authors *delirium ferox*. It is marked by a strong disposition to self-injury, so that the utmost caution is necessary to guard against accident: restraint is indispensable. Variolous delirium is sometimes accompanied with redness of the eye, contracted pupil, and a wild expression of countenance. The pulse is sharp, and the carotid and temporal arteries beat strongly; but it is seldom associated with plethora, and the loss of blood rarely gives relief. It is often, however, present without any of these evidences of arterial action; it is to be viewed, therefore, as a peculiar affection of the nervous system, the result of the variolous poison in irritable habits. As it ushers in the disease in a certain number of cases, and continues during the first days of fever, so does it almost invariably decline about the sixth or seventh day, when the maturation of the pustules commences. Excessive restlessness, anxiety and despondency of mind, are evidences of the same irritable condition of the nervous system. All these are symptoms of great danger. A large

proportion of such cases terminate unfavourably, some by coma, some by supervening erysipelas, some by acute inflammation of an internal organ (the pleuritic surface of the lung in particular) brought on, or determined by, the state of the brain. To this variety of small-pox Burserius and Frank have given the name of *variola nervosa.* Though generally associated with a full and confluent form of eruption, yet this is not essential; and it is sometimes found that intense delirium accompanies, and of course materially aggravates, the danger in distinct and semiconfluent cases.

5. In confluent small-pox the febrile symptoms experience no mitigation on the appearance of eruption. Throughout the whole period of maturation the pulse continues frequent, the skin hot, the thirst great; during the day the patient tosses about the bed restless and uneasy; his nights are passed without sleep, frequently with delirium: there is great weakness of the muscular fibre. As the disease advances to its crisis, symptoms of increasing cerebral irritation manifest themselves; the tongue becomes dry, and is protruded with difficulty and tremor; the stools and urine are passed involuntarily, or the urine is retained in the bladder; subsultus tendium and picking of the bed-clothes follow, and death takes place as in cases of typhoid fever implicating the brain.

6. The last peculiarity of the confluent form of small-pox is to be found in the symptoms which accompany the period of desiccation and decline. Many cases, indeed, die between the eighth and tenth days of the eruption; some, as we have pointed out, from affection of the brain; some from extensive disorganization and destruction of the skin and subjacent cellular texture; some from laryngeal complication, and consequent mal-oxygenation of the blood. But a certain number, partly from original strength of constitution, partly from a less intensity of disease, survive these critical days to enter on a new trial. The restorative process has commenced, but the struggle is attended with great constitutional disturbance, known to physicians by the name of the *secondary fever.*

The *secondary fever* supervenes chiefly in cases where the cellular membrane over the body has become extensively involved with the skin in inflammation, and where the mucous complication has been comparatively mild. Under such circumstances the strongest habits will suffer under the secondary constitutional disturbance: but many children, and some adults of weak habits, fall into it, with only a moderate extent of superficial inflammation. The state of the surface, therefore, and that of the constitution, are alike to be taken into account, when estimating the probability of its occurrence, and the danger when it has set in.

The *symptoms* of secondary fever may be thus enumerated:— The surface becomes hot and dry; the pustules hard and scaly; the tongue white; the pulse rapid; the patient gets no sleep, and is

tormented with an inextinguishable thirst. The evils of secondary fever, however, do not terminate with these evidences of inward tumult. In almost every case the violence of the fever falls on some one part; and the following is an attempt to classify the usual phenomena:—

1. In a very large proportion of cases the impetus of the fever is thrown upon some part of the superficies; nor need we wonder that parts already weakened and prone to inflammation, should be the first to suffer. An efflorescence, identical with scarlatina, occupies the chest, back, or extremities. The tongue is morbidly red, and not unfrequently the throat is red, swollen and painful. In other cases the cutaneous affection assumes the form of erythema, which in bad cases passes into confirmed erysipelas, with extensive vesications and high constitutional excitement. The head, trunk, and extremities are all equally subject to this kind of attack. Sometimes the cutaneous and cellular inflammation is more circumscribed; boils, abscesses, and carbuncles, occur in the neck, axillæ, groins, elbows, and thighs. In certain cases gangrenous inflammation attacks a large portion of the skin, especially the legs and feet, which in a few days lays bare the subjacent muscles. The same affection frequently shows itself in the first instance on the scrotum and prepuce, runs on rapidly to destruction of the part, and generally ends fatally. In parts exposed to pressure, especially the back and hips, sloughy ulcerations often take place, which, from their extent and depth, bring life into imminent hazard. In some cases the scalp is affected with diffuse cellular inflammation, and the head is immensely swollen; sometimes very deep-seated parts take on a like action. We have met with abscess beneath the scapula. In some few cases the larger joints fill with purulent matter. The disposition in inflamed parts, during the secondary fever of small-pox, to terminate in the effusion of pus, appears to be universal, and almost uncontrollable. In a certain proportion of cases the surface is occupied with a pustular eruption of the *ecthymatous* kind. It ends in the formation of ulcers pouring out a thin ichor, which heal with great difficulty. The thin cellular membrane under the lower eyelids is the frequent seat of such indolent sores.

2. Another structure which receives the shock of the secondary fever is the eye. Variolous ophthalmia is a subject of great extent and interest, and might claim for itself separate investigation; but as this form of ophthalmia is fully considered in works on ophthalmic surgery, we shall only offer a few details, the result of our own observation.

Variolous ophthalmia is often stated to arise from pustules on the cornea formed at the same time, and in the same way as pustules on the skin. This however is an error. Ophthalmia indeed sometimes attends the early stages of small-pox, but it is common conjunctival ophthalmia. Pustules of a true variolous character do not

form upon the conjunctival membrane: they may be traced just within the inner edge of the palpebræ, but not beyond it. The true variolous ophthalmia, by which sight is so frequently destroyed, is a *sequela* of small-pox: an incident in the progress of secondary fever, and almost always coincident with abscesses or extensive destruction of the surface in some distant part. It is an intense form of ophthalmia, setting in generally about the tenth day, and rapidly involving in destruction, more or less complete, some one or all the tissues of the eyeball. There is, first, sloughing of the cornea, followed by staphylomatous protrusion of the iris. In other cases the cornea thickens and becomes opaque, but by degrees, and in the course of two or three years, recovers entirely, or more or less completely, its transparency. Sometimes the whole ball of the eye takes on rapid and violent inflammation, and is converted into one immense protruding abscess. It is comparatively rare to meet with more than one eye involved in this destructive form of inflammation; but in all countries, and from the very earliest periods at which we read of small-pox, we meet with cases of total blindness ascribed to this disease. Not more than three cases of total blindness have left the Small-pox Hospital in the course of the last twenty years. Several other cases of double destructive ophthalmia have indeed occurred, but they all proved fatal from the severity of the accompanying disorders.

3. It is not to be supposed that fever, such as that we are now treating of, can rage without occasionally affecting the interior of the frame. The brain sometimes suffers. Children are observed to grind their teeth, and squint. By degrees the symptoms of cerebral inflammation are developed, and the child dies either in an epileptic fit, or in the state of coma. Adults may also occasionally be seen labouring under true phrenitis; and some, of plethoric habit, about the eleventh or twelfth day, become lethargic and ultimately comatose, vascular congestion having taken place in the brain. There is another condition of the brain and nervous system not unfrequently observed in the progress of secondary fever. It is identical with that which accompanies the destruction of large portions of skin by fire, and which is familiar to surgeons as the consequence of extensive burns and scalds. The symptoms are severe and repeated rigors, followed by general tremors, low delirium, a quick, thready, tremulous pulse, a dry brown tongue, collapse of the features, cold extremities, subsultus tendinum, and death.

4. In a certain number of cases the thoracic viscera suffer while the system is labouring under secondary fever, and the pleura (costalis and pulmonalis) is the structure which usually takes on diseased action. No obvious cause can be assigned for the occurrence of variolous pleurisy in the majority of cases. It often sets in most unexpectedly between the seventh and fourteenth days of eruption. In general its course is very rapid, terminating fatally on the third

or fourth day. We have seen it prove fatal in thirty-six hours. The symptoms are for the most part very urgent and unequivocal. There are agonizing pain of the side, extreme dyspnœa, with a hard, wiry, and incompressible pulse. The patient dies in great suffering, and on dissection the corresponding cavity of the chest is found filled with pus, or a sero-purulent fluid. In other cases, the symptoms are less violent, presenting at first the characters of pleurodyne or thoracic rheumatism. It is, however, to be kept in mind, that variolous pleurisy is sometimes unattended by prominent local symptoms. The disease is chronic and latent. Auscultation alone detects its existence. We have seen cases where acute rheumatism and hernia humoralis formed the only urgent symptoms during life, but on dissection one cavity of the chest was filled with pleuritic effusion. This will serve to show the importance of a careful and accurate exploration of the chest in all suspected and doubtful cases; though it is right to add, that these insidious internal inflammations, occurring while the system is labouring under intense fever, hardly admit, even if detected during life, of effectual relief from any mode of treatment.

The substance of the lungs has been found, in some few cases of secondary fever, to have been the seat of acute inflammation. Children are often attacked with symptoms of croup, and elderly persons are sometimes carried off by laryngitis. These cases are, however, very rare.

5. The abdominal viscera are, in a very remarkable manner, exempted from the ravages of small-pox. Sometimes we see children, in the course of secondary fever, labouring under the common subacute form of muco-enteritis, the belly tender, the stools ejected with force, the tongue red and aphthous. In a few cases, the peritoneal surface of the liver may be observed taking on inflammatory action; but the abdominal complications present no peculiar features, and require no specific notice.

6. The decline of small-pox is frequently mixed up with other evils not flowing from the same source, but arising either from the peculiarity of the patient's habit, or the circumstances under which he is placed. Thus it is that small-pox is so frequently seen at this period of its course, conjoined with scrofula. Nothing serves so certainly to call into activity the dormant seeds of scrofula as an attack of small-pox. Accordingly, we find the period of convalescence protracted by strumous ophthalmia, known by the complete intolerance of light, the forcible closure of the eyelids, the abundant secretion of tears, and an obstinate resistance to every kind of remedial treatment. We find, in like manner, at this period, enlargements of the cervical glands, which sometimes suppurate, but more often continue hard, indolent, and intractable. Severe otitis arises in such habits from accidental exposure to cold. Scrofula develops itself in the joints or invades the bones. It happens but too often,

that the seeds of tubercle and pulmonary phthisis are laid during the progress of small-pox, and especially when the secondary fever has been severe and tedious.

[Hemorrhage is by no means an unfrequent complication, and is a very dangerous one. It occurs generally in the abnormal forms of the disease. Epistaxis, happening early in the attack, and which is generally of the active kind, must not be confounded with the dangerous passive fluxes in the malignant varieties. Any organ may be the seat of the hemorrhage, but it is rarely abundant without the skin participating. Next to the skin the various mucous membranes generally furnish the blood, then the lungs, and afterwards the urinary apparatus, and muscular system. From the third to the fifth day, is the most common epoch of its appearance. When the skin is affected, the effused blood may occupy the pustules themselves, their circumference, or the intervals between them.]

Lastly, the decline of small-pox may be complicated with fever of a different character, attributable, not to the variolous poison, but to some miasm generated by the accumulation of malignant cases, and received into a system already weak and exhausted. To this source some part of the mortality in all hospitals devoted to the reception of small-pox must in fairness be attributed. Vitiation of the air is almost inseparable from the nature of an hospital, and the offensive exhalations from the surface in small-pox are pre-eminently calculated to generate a noxious febrific miasm. Hospital fever, as it may well be called, thus originating, attacks all persons within its influence. It shows itself under the following aspects:—1. Typhus Fever; 2. Erysipelas; 3. Inflammation of the mucous membrane of the throat and of the subjacent cellular membrane; 4. Hospital gangrene. One or more of these very formidable complaints may attack persons during the secondary fever of small-pox, or as they gradually emerge from it. It is unnecessary to say how fearfully the danger of the patient is thereby increased. The mildest forms of small-pox are not exempt from this additional calamity.

Having now described the two principal varieties of small-pox, we proceed to explain the distinctive characters of certain others which have been noticed by authors, and to which specific appellations have been attached. We shall enumerate them in the following order:—1. *Variola semiconfluens;* 2. *Variola corymbosa;* 3. *Variola maligna;* 4. *Variolæ anomalæ;* 5. *Variola confluens mitigata, sive Variola verrucosa;* 6. *Variola varicelloides;* 7. *Febris variolosa sine eruptione.*

C. VARIOLA SEMICONFLUENS.

The semiconfluent variety of small-pox is intermediate between

the distinct and the confluent, partaking sometimes of the mildness of the one, sometimes exhibiting many of the worst features of the other. It is difficult to offer any adequate explanation of these differences. Much depends on the constitution of the patient, something upon age, something too upon the condition of the mind.

D. VARIOLA CORYMBOSA, OR COHERENT SMALL-POX.

This term, as we have said, is applied to cases of partial confluence, that is, to cases where the vesicles are grouped into clusters, leaving intermediate spaces of unoccupied skin. Most of these partake of the general character of confluent small-pox. It often happens, in this form of the disease, that the maturation is imperfect. Instead of well-formed vesicles, blebs or bladders form, which fill with a thin semi-purulent fluid. Many of these cases run into secondary fever. Erythematous inflammation succeeds, probably in consequence of the imperfect concoction of the matter; and ulcers, followed by deep pits and eschars, are the unavoidable result. Much irregular fever accompanies the coherent small-pox. The cellular membrane is less extensively affected than in the thoroughly confluent variety.

E. VARIOLA MALIGNA.

The distinctive characters of this truly formidable variety of small-pox have been acknowledged in all ages. To the usual phenomena of the disease are superadded those which indicate a dissolved or putrescent state of the blood. This implication of the fluids of the body gives to the small-pox a character well designated by the word *malignant*. The term *petechial small-pox* is equally appropriate. The evidences of malignity are perceptible in some cases from the first moment of febrile invasion. At other times they are perceived only when the eruption begins to develop itself. The initiatory fever is sometimes attended with petechiæ, large patches of subcutaneous ecchymosis (called vibices), or with hemorrhage from the nose, mouth, stomach, bowels, or uterus. The aspect of countenance is squalid, the urine dark-coloured, the breathing anxious, hurried, and irregular. Under these circumstances, death has taken place prior to any unequivocal appearances on the skin. That such a disease is undeveloped small-pox must always remain a matter of some doubt; but the fact can often be inferred from a careful investigation of the prior history. It will be found, for instance, that the patient had never previously undergone small-pox; that he had been exposed to small-pox infection within that reasonable limit of time which affords presumptive proof; or lastly, that he may himself, in turn, have communicated small-pox to others.

Many cases considered to be idiopathic malignant fever, proving fatal at an early stage, are in reality cases of undeveloped variola maligna.

During the maturative stage, malignant small-pox is characterized by the same kind of mucous and subcutaneous hemorrhages. The gums bleed, and often very profusely; there are bleeding from the nose, spitting of blood, vomiting of blood, and the passage of blood by stool. Menorrhagia displays itself in females, and abortion scarcely ever fails to occur in such as are pregnant. The fœtus dies in utero. As the disease advances to maturation, the vesicles fill, not with pus, but with a bloody ichor. Livid spots or petechiæ are interspersed among them. The eye is frequently the seat of extensive ecchymosis. This variety has been called the black pock (*variolæ nigræ*). The malignant form of small-pox is generally found associated with confluence of eruption, both on the skin and mucous membranes. Sometimes, however, the eruption is of the semiconfluent or coherent kind, and, more rarely still, distinct. Though delirium generally exists, it is yet by no means uncommon to find the mind perfectly clear throughout the whole course of petechial small-pox. This most aggravated state of the disease scarcely offers any reasonable ground of hope. Death usually takes place between the fifth and seventh days from the first appearance of eruption, nature showing little or no disposition to forward the maturation of the pustules. We have seen death take place under these appalling circumstances, with the intellect quite unimpaired.

F. VARIOLÆ ANOMALÆ.

Under this head authors have arranged a variety of singular anomalies and rare complications. It were a vain and profitless task to enumerate them all, but some of the more common, and a few of the most rare, may advantageously be mentioned. Small-pox may occur to persons who, at the time of seizure, are labouring under some other malady, such as bronchitis, hooping-cough, pneumonia, phthisis, or other pulmonary disease. The complication of small-pox with an acute or subacute form of bronchitis is very common during the winter months in this country, and it demands in almost all instances the treatment appropriate to the concurrent disorder. Small-pox may occur simultaneously with measles (De la Garde, *Med. Chir. Trans.*, vol. xiii.), scarlet fever, and cow-pox. It may occur to persons of exceedingly weak habit of body, either constitutional or induced by long prior illness, such as a severe typhus fever. Under these and similar circumstances of extreme debility, we notice tardiness of eruption, collapse without advance of eruption, an abundant formation of large blebs, a tedious and hazardous period of convalescence.

Among the anomalies of small-pox, we may enumerate its occur-

rence in the African negro, whose peculiar constitution of skin prevents the development of areola.

Lastly, we may specify among the rarer occurrences the appearance of small-pox in the fœtus at birth, showing that it must have imbibed the germ of the disorder, and gone through its earlier stages in utero. (JENNER, *Med. Chir. Trans.*, vol. i.) In the case recorded by JENNER, the mother experienced no indisposition herself. MEAD entertained the fanciful notion, that persons who showed in after life a complete insusceptibility to small-pox, might possibly have passed through the disease in the fœtal state. (MEAD *on Small-pox*, chap. iv.)

G. VARIOLA CONFLUENS MITIGATA.

A rare variety of small-pox was described by VAN SWIETEN and others, under the title of *Stone-pock*, *Horn-pock*, *and Wart-pock*, (*Variola verrucosa*, or *cornea.*) This is now very frequently observed, it being one of the many forms in which small-pox shows itself after vaccination. The initiatory symptoms are generally urgent. The eruption is abundant over the whole body, and often the aspect of the disease, for the first two or three days, is very unpromising. On the third or fourth day, however, a modification or mitigation of symptoms manifests itself. The vesicles shrivel, and a few only attain an imperfect maturation. The greater number harden, and are converted on the sixth day into small tubercles, which gradually disappear. The febrile symptoms rapidly subside, and the patient, in less than a fortnight, is free from any perceptible complaint, except, perhaps, some weakness of the eyes. The absence of secondary fever is the great characteristic of this variety of small-pox. One of the peculiarities of the variola confluens mitigata, is the unequal advance made by the papulæ on the same portion of the surface: on the face, or on the arm, for instance, pustules rapidly maturating, others of smaller size dying off, and some becoming tuberculated, with little or no surrounding inflammation, may be perceived at one and the same time. This mitigated form of small-pox, now so common among the vaccinated, is still occasionally seen in persons who have never been vaccinated. Such mildness is attributable either to the general character of the epidemic, or to the idiosyncrasy of the individual. His system receives the small-pox in the first instance, perhaps, with alarm, but ultimately eliminates it with ease and safety. One of the remarkable effects of cow-pox is to create, *artificially*, a constitution thus favourably disposed towards small-pox. It multiplies the cases which our ancestors saw, and described under the name of variola verrucosa.

H. VARIOLA VARICELLOIDES.

The umbilicated pustular Varicella of Rayer.

This is the mildest form in which small-pox is ever seen. The initiatory symptoms are never urgent; in some cases they escape observation. The eruption shows itself on the third day from the invasion of fever. This circumstance will afford useful aid in determining the character of the disease, and distinguishing it from varicella vera, with which it is so liable to be confounded. In the true varicella, the eruption shows itself, for the most part, without any prior symptoms, or, at least, within twenty-four hours from the occurrence of a slight febrile commotion. The diagnosis is completed by observing the grouping of the papulæ, and their construction. When the disease is truly variola, the pimples never fail to show (either with or without the aid of the microscope), central depression. This great and undoubted criterion of variolous origin cannot be present, unless the morbid germ had lain dormant in the system during the long period necessary for such a development. A crop of vesicles may, indeed, be thrown out on the surface after a brief period of incubation; but such vesicles are mere elevations of cuticle (minute blisters in fact), presenting no regular organization. Such is the pathological character of the genuine varicella, or chicken-pox. In some cases the resemblance between the variola varicelloides and chicken-pox is so close, the febrile commotion so trifling, and the progress of the disorder so rapid, that doubts may reasonably exist as to the real nature of the complaint. None but those who are in the constant habit of seeing such cases, of tracing them to their source, and of observing the minute gradations by which nature connects the severe and mitigated forms of small-pox, could recognize, in a few scattered papulæ over the face and arms, the same disease which in another form, bids defiance to every effort of human skill, and hurries its victim to a premature grave. This variety of small-pox, singularly mild as it is, was known to physicians before the time of Jenner. It is clear, from the perusal of Dr. Heberden's paper on chicken-pox, published in 1767, that such a complaint was well known to him; and that it gave occasion then, as now, to diagnostic doubts and difficulties. Since the discovery of vaccination, these cases of variola varicelloides have multiplied prodigiously, and are now familiar to all.

I. FEBRIS VARIOLOSA SINE ERUPTIONE.

Sydenham entertained the opinion, that during years when small-pox was epidemic, a variolous fever was also to be met with, which showed no eruptions. He devotes a chapter (sect. iii. chap. iii.) expressly to the consideration of this disease. Our views re-

garding the pathology of small-pox have undergone a material change since the time of Sydenham, and the notion is now generally considered fanciful, but as it has received the sanction of some later writers (Burserius, Vogel, P. Frank, De Haen, Fouquet, Gatti, Hedlund), we may offer a few observations concerning it. The circumstances that induced Sydenham to connect a particular form of fever with small-pox, were the following:—1. It appeared in years when small-pox was epidemic; 2. It was ushered in by the same tenderness of the epigastrium which distinguishes incipient variola; 3. It was accompanied by petechiæ, salivation, profuse spontaneous sweats affording no relief, and other symptoms observable in a regular small-pox; 4. It was benefited by the same cooling system of treatment. M. Hedlund of Hernœsand, during the Swedish epidemic of 1824, states (Magendie, *Journ. de Physiologie*, tom. vi.), that three different forms of disease were then observed, all, as he believes, pathologically allied, viz., true small-pox, the varioloid, and a fever without eruption. This fever, he adds, began and ended at the same time with the epidemic. The early symptoms were identical with those which preceded the variolous eruption. He considered it as a mild undeveloped small-pox. The numbers attacked with this eruptionless fever, constituted the third part of the whole number attacked during the epidemic. "Perhaps," says M. Hedlund, "small-pox has the power of engendering an epidemical constitution, which influences other maladies reigning at the same period." Some authors of less note have even fancied that such variolous fevers have given subsequent immunity from small-pox. We have met with cases which bear out the notion of a mild variolous fever without developed eruption; and as the identity of a highly modified varioloid fever with true small-pox is admitted, so would it be wrong to discountenance entirely the notion of a *febris variolosa sine eruptione*.

II. DIAGNOSIS.

Before the appearance of eruption, the diagnosis of small-pox is always liable to uncertainty, even with every attention to the character of the prevailing epidemic, for the precursory symptoms are common to other diseases. The grounds on which we attempt, at this early period, to determine the nature of the approaching disorder, are, 1. The suddenness of the attack; 2. The absence of previous ailment; 3. The exposure to variolous contagion; and, 4. The having previously undergone one or more of the exanthemata. The diseases with which, after the occurrence of febrile eruption, small-pox may be confounded, are measles, febrile lichen, varicella, and secondary syphilis.

1. The papulæ of true small-pox are firmer than those of measles. They feel granular, like hard bodies, under the finger. In measles

too there are accompanying cough, and watering of the eyes. Further, forty-eight hours elapse in small-pox from rigor to eruption; seventy-two hours in measles. 2. Febrile lichen is the disease from which small-pox, at the onset of eruption, is with most difficulty distinguished. The aspect of eruption is in both cases nearly alike. The surest and safest grounds of diagnosis are based on the interval which has elapsed from rigor to eruption, and the seat and extent of eruption. In febrile lichen twenty-four hours elapsed from sickening to eruption; in small-pox, as we have said, forty-eight. Small-pox almost always appears first on the face; the eruption of lichen is equally developed, from the first, on the trunk and head. 3. The diagnosis of small-pox and chicken-pox has been already pointed out. 4. There is a form of secondary syphilis, in which an eruption appears on the face and trunk very similar to distinct small-pox. This eruption passes through the several grades of papula, vesicle, and pustule. It is preceded by a febrile attack of variable duration. The circumstance has in many instances given rise to the notion of small-pox occurring twice. A case of this kind fell under our own observation very recently. The diagnosis is to be effected by accurate inquiry into the prior history of the case, and the further progress of the eruption. The pustular syphilitic eruption runs a tedious course, exceeding ten days; and the pustules are developed, not simultaneously as in small-pox, but in successive crops.

III. PROGNOSIS.

The danger in small-pox is dependent on a variety of circumstances, but chiefly on the following:—1, on the quantity of the eruption; 2, on the condition of the mucous membrane; 3, on the state of the fluids; 4, on the state of the nervous system; 5, on the age of the patient; 6, on his habit of body; 7, on the circumstances in which he is placed, and the treatment adopted.

1. Distinct small-pox is a disease of little or no danger. Confluence is always unfavourable, especially on the face; nor is the nature of the danger always understood. A confluent case shall sometimes appear to progress favourably, when unexpectedly a convulsive fit occurs, and the patient is destroyed. The drain which confluence necessarily occasions in the system is sometimes the obvious cause of danger. Nevertheless, if the pustules on the extremities acuminate well, and are surrounded by a crimson areola, a good ground of hope exists. If the vesicles on the trunk and extremities, on the other hand, be flat, with a clarety areola, while the eruption on the face is white and pasty, no reasonable hope of recovery can be entertained.

2. The condition of the mucous membranes, especially that of the larynx, is equally important with reference to prognosis. Hoarse-

ness at an early period of the disease is always unfavourable. A natural tone of voice, again, is a good omen, even though the eruption be full and confluent, with a disposition to cellular inflammation. The appearance of the mouth and throat will also serve as a useful guide to the probable state of the larynx and trachea.

3. The condition of the fluids is a circumstance by which the physician will in a great degree be guided in his prognosis. Everything which indicates malignancy and putrescency is highly unfavourable. Petechiæ, menorrhagia, mucous hemorrhages, and vesicles filled with a bloody ichor, are therefore among the worst signs that can occur. Recovery from the petechial small-pox has been recorded, but it is among the rarest events which the history of this disease presents.

4. A tranquil state of the brain and nervous system is particularly favourable, and is the circumstance to which the recovery of all severe confluent cases is mainly attributable. Quiet nights, composure of manner, a contented disposition, and confident hope of recovery, are good signs; restlessness, on the other hand, a continual moaning, despondency of mind, and a succession of sleepless nights, afford but little hope of recovery. Children who grind their teeth seldom do well.

5. Age is a point of great moment in estimating the comparative degree of danger in confluent and semiconfluent cases; the extremes of life are those on which small-pox always falls the heaviest. Persons above forty years of age seldom recover even from semiconfluent small-pox; infants are in danger even from a moderate quantity of eruption; in both the process of cicatrization is attended with great exhaustion of nervous power, the result of which is, that some internal organ necessary to life (the larynx, brain, or lungs), takes on acute and rapidly destructive inflammation. The arteries here act without the due control of the nerves. The most favourable age for taking small-pox is from the seventh to the fourteenth year, when the powers of life are in full vigour, without the risk of plethora.

6. The habit of body is, of course, also to be taken into account. Small-pox is always aggravated by its concurrence with a *plethoric* habit. Great constitutional debility is equally to be dreaded. In the strumous habit the sequelæ of small-pox are peculiarly severe, and often bring life into danger after the crisis has been passed.

7. The probability of recovery must depend, lastly, upon the circumstances under which the patient is placed; on the possibility of applying remedial measures effectively; on the treatment which has been pursued in the early stages, and other contingencies which scarcely admit of enumeration. In hospitals the danger of contracting fever and erysipelas during the later stages is never to be lost sight of. In private life, small rooms, superabundant bed-

clothes and ill-timed cordials may aggravate or bring on local congestions and inflammations, from which the hospital patient is exempted. In certain seasons and states of the air, small-pox is more to be dreaded than at other times.

These principles of prognosis will lead naturally to the consideration of the average mortality in small-pox, the usual sources of death, and the morbid appearances.

IV. MORTALITY.

The average mortality by small-pox is usually stated as one in four of those attacked, or twenty-five per cent. At the Small-pox Hospital the extremes have been fifteen per cent. and forty-two per cent. The average of twenty-five years prior to the introduction of vaccination gave thirty-two per cent. The proportion which the mortality by small-pox bears to the total mortality in any town or district, has been a favourite subject of inquiry with all writers on medical statistics. Prior to 1800, that is, before the period when vaccination influenced the results, the deaths by small-pox were to the total deaths, both in town and country, as 16 to 100. It was observed by all writers, that in the unprotected the greatest mortality takes place in the early periods of human life. Dr. Haygarth computed that at Chester, in the latter part of the last century, one-half of the deaths in children below ten years of age was due to small-pox. The mortality is heaviest from the second to the fifth year. From the first Report of the Registrar-General of England, it appears that in 1837 there were only five diseases more fatal in England than small-pox, and that the deaths throughout England and Wales by that disorder amount now annually to about 12,000.

Small-pox may prove fatal at any period from the first invasion of fever to the fortieth day. Death may even take place prior to the development of eruption; but such cases are rare. In all countries it has been observed that the eighth is the day of greatest danger, and the second week that which exhibits the greatest amount of mortality. The annexed table, extracted from the records of the Small-pox Hospital for 1828–9, showing the period of eruption at which 168 patients died, and the days on which the disease proved fatal, illustrates this, while it points out how little importance can be attached to the doctrine of critical days in small-pox.

Of 168 fatal cases of small-pox, there died on the

1st week. Days.	Cases.	2d week. Days.	Cases.	3d week. Days.	Cases.	4th week and later. Days.	Cases.
3d	1	8th	27	15th	7	22d	3
4th	5	9th	15	16th	5	23d	1
5th	10	10th	14	17th	3	24th	3
6th	5	11th	16	18th	3	25th	1
7th	11	12th	11	19th	1	27th	1
	—	13th	11	20th	2	28th	1
	32	14th	5		—	29th	1
			—		21	31st	1
			99			32d	1
						35th	1
						38th	2
							—
							16

The mortality varies, of course, with the character of the eruption. The subjoined table shows the proportion in which each variety of small-pox proved fatal at the Small-pox Hospital during the epidemic of 1838.

Table exhibiting the comparative Mortality in the several varieties of Normal and Abnormal Small-pox at the Small-pox Hospital, during the epidemic of 1838.

	Unprotected.		Vaccinated.	
Normal Small-pox.	Admitted.	Died.	Admitted.	Died.
Confluent, - -	295	149	56	21
Semiconfluent, - -	78	8	42	4
Distinct, - - -	19	0	20	0
Total Normal, -	392	157*	118	25
Abnormal Small-pox.				
Confluent modified, -	2	0	38	4
Semiconfluent modified,	1	0	28	1
Varicelloid, - -	1	0	114	1
Total Abnormal, -	4	0	180	6
Grand total, -	396	157	298	31†

The following table will complete this branch of the subject by pointing out the comparative mortality of small-pox at different ages, distinguishing the vaccinated from the unvaccinated.

* Of these there died of fever and superadded erysipelas, 14.
† Of these there died of fever and superadded disease, 10.

Table exhibiting the Mortality of Small-pox at different ages and under different circumstances, as displayed at the Small-pox Hospital of London, in the epidemic of 1838.

Ages.	Unvaccinated.		Vaccinated.	
	Admitted.	Died.	Admitted.	Died.
Under 5 years of age,	42	20	0	0
From 5 to 9 inclusive,	37	11	5	0
" 10 to 14 "	30	8	25	0
" 15 to 19 "	104	32	90	6
" 20 to 24 "	115	50	106	16
" 25 to 30 "	45	23	55	8
" 31 to 35 "	12	7	13	1
Above 35 years of age,	11	6	4	0
Total,	396	157	298	31

The immediate causes of death in small-pox are various, as the preceding detail of symptoms will have shown, but it may be useful to exhibit them in a condensed form: 1. Prior to the maturation of the pustules (that is, from the invasion of fever to the seventh day of eruption), small-pox proves fatal by that general derangement of the system which occurs in *malignant fever*. Such a condition of the body is well designated by the term *acute malignancy*. 2. During the second week of eruption, the chief cause of death is to be found in affections of the larynx and trachea, and consequent suffocation. 3. During the third week, that is, during the stage of secondary fever, death may happen either by general excitement leading to effusion in the brain, or by supervening pleurisy, pneumonia or laryngitis; or, lastly, by extensive sloughy or gangrenous destruction of the skin. 4. During the fourth week, and at still later periods of the disease, death may take place from mere exhaustion, or it may be the result of erysipelas, or of some other disease excited by the small-pox, or engendered by that constitutional debility which such a disorder in any of its severer forms so frequently leaves.

[V. STATE OF THE BLOOD.

The blood was analyzed by Andral and Gavarret in 5 cases of true variola and 2 of varioloid disease. In all the cases of variola the eruption was confluent. The blood-corpuscles differed but little from their normal standard, but the quantity of fibrin varied considerably, although the increase above the normal mean was only small. It is worthy of remark, that the quantity of fibrin appears to increase, although only slightly, by repeated bleeding; a circumstance which, according to Andral and Gavarret, cha-

racterizes the phlogoses. This may be due to the inflammatory state of the skin in this disease, although we do not perceive a similar occurrence in typhoid fever, in which the mucous surface of the intestine is in a somewhat similar state.

Their analyses gave the following results:

Venesection.		Water.	Fibrin.	Blood-corpuscles.	Residue of serum.
1st Case	1	771·5	4·4	120·6	103·5
	2	780·8	2·9	110·2	106·1
	3	820·2	3·2	94·6	82·0
2d "	1	791·3	3·0	114·3	91·4
	2	803·9	3·2	92·6	100·3
	3	811·8	3·0	88·4	96·8
	4	817·3	3·3	87·0	92·4
3d "	1	781.4	2·6	127·9	88·1
	2	792·0	3·5	124·4	80·1
4th "	1	796·0	4·1	126·5	76·4
	2	792·7	2·0	124·9	80·4
5th "	1	805·0	2·9	98·8	92·3

The residue of the serum contained on an average 7·0% of inorganic constituents.

In the first case, the first bleeding was ordered at the commencement of the disease, during the febrile period; the second at the commencement, and the third at about the middle of the eruptive stage. In the second case, the first bleeding was ordered some days before the appearance of the disease; the second during the fever; the third on the third day of the eruption, and the fourth on the sixteenth day of the eruption. In the third case, the first bleeding was ordered at the commencement of the eruption; the second during the suppurative stage. In the fourth case, both venesections were prescribed during the height of the eruption. In the fifth case the pustules were filled with blood (variole hémorrhagique:) the bleeding was ordered when the eruption was at its height.

The analyses of blood in varioloid gave the following results:

Water.	Fibrin.	Blood-corpuscles.	Residue of serum.
785·6	2·3	120·3	91·8
782·1	2·4	125·8	89·7

The residue of the serum contained 7·6% of inorganic matter in the second analysis.

In the first instance the bleeding was performed on the 3d day; and in the second case on the 2d day of the eruption.*]

VI. ANATOMICAL CHARACTERS.

Small-pox offers the only instance of a constitutional disorder which has for the immediate cause of death the condition of the surface. Extensive burns and scalds afford, in the practice of the

* [Simons' Animal Chemistry, p. 244.]

surgeon, abundant opportunities of witnessing the excessive constitutional disturbance occasioned by the destruction of large portions of skin, and death so brought about. The physician sees it only in the case of small-pox. In many instances, the state of the surface is the sole cause of death. In others, the disorganization of the mucous tissues has gone on *pari passu* with the superficial injuries. In a third set of cases, serious lesions of internal parts are observed, but many of these are the mere consequences of the cutaneous disorganization, and of the impediments to transpiration thereby occasioned.

The condition of the surface after death by confluent small-pox has been described with considerable accuracy by many authors, but by no one has the subject been so minutely examined as by Dr. Petzhold of Leipzig, who derived his experience from an epidemic which prevailed in that town in the winter of 1832–33.* It is by examination of the skin after death, that modern pathologists have obtained that insight into the structure of the variolous pock, and the changes produced on the several parts of the cutaneous tissue in the further advance of the disease, which have been already noticed. The base of each pock presents, in almost all instances (except in the palm of the hand and sole of the foot), a small depression or aperture, formed by the rupture of the excretory duct of a cutaneous gland. The portion of cutis not occupied with pocks is loaded with a white puriform matter, which, as in the case of the pustules, wedges itself in between the bundles of vessels. At an early period of disease, the undermost layers of the epidermis are in a softened state. At a later period, its connection with the cutis is altogether destroyed. The cutaneous glands are always more or less swollen, so as to assume a pyriform shape, and their excretory ducts are frequently much distended by the secretion of the glands, which are always found more vascular than in their healthy state. The epithelium of the tongue and mouth is much softened. The subjacent mucous membrane frequently exhibits erosions varying in depth. The mucous follicles of the tongue and tonsils are observed to be greatly distended, and their mouths to gape so widely as to admit readily the entrance of a large probe.

The appearances of the most importance are those presented by the mucous surface of the larynx and trachea. In all severe cases implicating those structures (provided death takes place prior to the twelfth day), the marks of destructive inflammation in them will be apparent; that is to say, the membrane appears deeply congested with blood, and covered with a copious viscid purulent or puriform secretion of a gray or brownish colour. On detaching this, the membrane itself appears thickened, pulpy, and in the worst cases black or sloughy. A closer examination of the parts affords the following

* Die Pocken-krankheit mit Racksicht auf die Pathologische Anatomie. Leipsig, 1836. A copious analysis of this work, in as far as relates to the morbid anatomy of small-pox, may be found in the *Brit. and For. Med. Rev.*, vol. v.

appearances. The surface of the epithelium exhibits, in an early stage of the disease, a number of dim spots of a round form, and of the size of lentils, produced by the exudation of a fluid between the epithelium and the subjacent mucous membrane. In the further advance of the disease, this effusion becoming more copious raises the epithelium, which may then be stripped off, exposing the inflamed and sometimes ulcerated mucous membrane. The diseased appearances of the trachea are not always uniformly diffused over the whole surface, though the epithelium is easily separable even from the unaffected parts. The ulcerations vary both in number and depth, extending sometimes to the submucous cellular texture. Disorganization of the bronchial mucous membrane may be traced into the third series of branches.

The œsophagus has been found in some instances to be studded with minute elevations, which have been described as pocks. This appearance is very rare. The lungs exhibit, in some cases, the usual evidences of inflammatory action, viz., vascular engorgement, purulent infiltration, and hepatization; but the chief appearances within the chest are those presented by the serous membrane. The pleura of one side (rarely, if ever, of both sides) is found to exhibit the marks of recent and perhaps of very intense inflammatory action. It appears highly injected with blood, and covered with a thick layer of coagulable lymph, while in the corresponding cavity of the chest there is abundance of sero-purulent fluid, resembling cream and water, with shreds of lymph floating in it. In many cases, so copious is the inflammatory exudations, as to fill completely one side of the chest, and to compress the lung of that side into a very small space. [Lobar pneumonia is much more common than lobular, the reverse of that which takes place in measles. *Serous congestion* is the marked characteristic of variolous pneumonia. "It is astonishing," observe Rilliet and Barthez, "to see the quantity of sanguinolent serosity which the slightest pressure forces from the inflamed parts. This serous congestion often extends over the entire lung, even when there is little or no pneumonia—constituting true pulmonary œdema."]

In the cranium the morbid phenomena observable in small-pox present no features of peculiar interest. In persons cut off by convulsion or coma, the same appearances may be found as under like circumstances where no affection of the surface is present. A general vascularity of the brain and its enveloping membranes will probably present itself, with some effusion of turbid serum between the membranes, or in the ventricles, or in the theca vertebralis.

Much difference of opinion has prevailed regarding the abdominal appearances met with in those who die of small-pox. Sir Gilbert Blane has recorded a case wherein the mucous membrane of the bowels is reported to have been occupied with small round ulcerated spots. Many pathologists have expressed their belief that true variolous pustules have been found in the gastro-enteric mucous

membrane. Others, again, among whom may be mentioned Cotunnius Wrisberg, and Reil, (who have paid great attention to the subject,) are of opinion that this structure is incapable of developing variolous pustules, and that the appearances so described are in reality inflamed, enlarged, or ulcerated follicles, with petechial patches, similar in all respects to what are found in the common forms of idiopathic or typhoid fever. This pathological principle is fully borne out by the experience of the Small-pox Hospital. We may add, however, that even these appearances are very rare, and that the freedom of the abdominal viscera from urgent symptoms during life, and from all trace of disorganization after death, is a remarkable feature in the disorder. Inflammation may, indeed, originate from accidental causes in any internal organ during the progress of small-pox, and its effects will be seen after death; but these are not to be confounded with the specific and acknowledged effects of the variolous poison upon the skin and mucous membranes of the throat and chest. [MM. Rilliet and Barthez describe the follicular eruption as consisting of small hemispherical projections, either pointed or slightly flattened, with often a small central black point, which is sometimes depressed. On pricking these projections, after carefully drying them, a little drop of serous fluid escapes. All this encourages the belief of their variolous or vesicular character, but this is discountenanced, from the following facts: 1. Identical serous projections exist in other diseases, and are therefore not peculiar to variola. 2. A variolous vesicle cannot be formed where no epithelium exists. 3. Rilliet and Barthez have never seen in the intestines those small false membranes, or other lesions, resembling those found on the other mucous membranes, as the mouth, pharynx, or larynx. The anal orifice is the only point of the intestinal mucous membrane, upon which variolous pustules are found. 4. Another proof exists in the condition of the agminate follicles, which are often as much developed as the isolated. They are large, projecting, softened, and often reddened, simulate the patches in typhoid fever at their commencement, and differ from them only in not presenting any ulcerations. Rilliet and Barthez affirm that they have never met with, and believe it is very rare to find, enlargement, redness, or softening of the mesenteric glands. The intestinal mucous membrane frequently exhibits traces of anterior congestion—being covered with a layer of thick and adhesive mucus; or presents a general iron-gray colour, with occasional dark punctations. The same authors assert that most of the organs exhibit more or less intense sanguineous congestion:—the muscles are red and firm; the membranes and the substance of the brain much injected; and the sinuses gorged with blood. On dividing the pulmonary vessels blood flows abundantly; and the liver, spleen, and kidneys are in the same condition. But exceptions to this rule are met with, and several times, when the eruption was pale, little or no injection was observed in the various organs after death.

MM. Rilliet and Barthez have very generally observed the blood, especially in the cavities of the heart and large vessels, fluid and serous, and sometimes of the colour of wine lees. If there are clots they are small, black, and diffluent; it is rare to find them colourless and fibrinous.]

VII. CAUSES.

The phenomena of small-pox being thus described, we proceed to investigate its causes, to unfold what is known regarding its mode of origin and propagation, and the circumstances under which it most commonly displays itself. The notions entertained on this subject at the present time differ most materially from those which prevailed at an earlier era of the world, and are perhaps still susceptible of improvement. For more than a thousand years after the first appearance of small-pox, it was believed by all physicians to originate like other fevers; that is to say, either from some vitiated state of the fluids of the human body, or from some peculiar state of the atmosphere. To this day a large portion of mankind believe that small-pox may be *bred in the blood*, independent of all external agency. Boerhaave adopted the notion that small-pox was in all cases the product of a specific poison, miasm, or contagion derived from some one already labouring under the malady. This opinion strengthened during the latter part of the last century, until at length Dr. Haygarth, Dr. Jenner, and others promulgated the notion, that by a system of quarantine and other measures of precaution, the small-pox might be utterly banished from the earth. The latter opinion is now acknowledged to be doubtful in theory and utterly visionary in practice; but a belief that small-pox is in all cases the result of a contagion received from without, is adopted by all the best pathologists and practical physicians of the present day. It would certainly be difficult to support the doctrine of spontaneous origin by arguments which would be generally received: but while we admit the hypothesis of contagious origin, we must not shut our eyes to the importance of the facts which connect small-pox with other epidemic maladies, such as the Egyptian plague, malignant cholera, influenza, and hooping-cough, where the notion of contagious origin is only partially admitted. To understand the origin and propagation of small-pox, therefore, it must be viewed not only as a contagious, but as an epidemic disorder.

1. Contagious origin of Small-pox.—The contagion of small-pox emanates from the human body at every period of the disease, from the first invasion of fever to the throwing off of the latest scabs. Heberden and Haygarth affirmed, that during the initiatory fever, and for the two or three succeeding days, a patient

seldom, if ever, communicated the infection. But this is incorrect. The dry scabs of small-pox retain the contagious property for a great length of time. Experience, too, has shown, that for a considerable time after death the matter of the pustules continues energetic, and that a confluent case will taint the air and spread the disease for at least ten or twelve days after death. (Hawkins, *Lond. Med. Gaz.*, vol. iii.) Nothing is better ascertained regarding the contagion of small-pox, than the fact, that the kind of disorder produced bears no certain relation to the kind or intensity of the case producing it. A confluent case shall give origin to a varioloid, and a mild distinct case shall generate a confluent and malignant one. The circumstances that determine severity in any individual case, whether of small-pox or of any other exanthema, are very little known to us. The following is only an imperfect attempt to illustrate this problem in the history of small-pox.

The quantity of eruption is sensibly influenced by the state of the surface at the period of its development. Whatever tends to augment the cuticular circulation, increases confluence, such as the warm bath, abundant bed-clothes, strong diaphoretic and sudorific medicines, wine and cordials, and great heat of the apartment. All local irritants, such as blisters, mercural inunction, and plasters, favour confluence in parts to which they have been applied. Cold represses the number of papulæ, though not so certainly as heat favours them. Active purgatives taken during the incubative stage lessen the extent of cutaneous inflammation. A plethoric state of body increases the intensity of the disorder, and is mainly instrumental in occasioning cellular complication. An irritable condition of the nervous system gives occasion to that conjoined affection of the brain and nerves which authors have called *Variola nervosa.* Extreme weakness of body appears often to be the direct cause of that dissolved state of the fluids which we call acute malignancy; but not always, for malignancy, as Huxham well observed, is compatible with plethora. Lastly, it may be remarked that there exists in certain individuals, and not unfrequently in many members of the same family, a peculiar irritability under the influence of the variolous contagion. They receive it with alarm, they develop it with pain, and get rid of it with difficulty. Such constitutions may truly be said to be *poisoned* by it. Again, other persons imbibe the morbid germ mildly, nourish it without suffering, and eliminate it safely and kindly. All this is referable to idiosyncrasy.

The variolous contagion is capable of attaching itself to fomites, more especially bed-furniture, clothes, and bedding. These, if closely wrapped up and secluded from the air, will retain the matter of the disease and give it out to others at great distances of time. But free exposure to the air greatly diminishes or altogether destroys this infecting property; for the contagion of small-pox is of a very volatile nature. The medical attendant, therefore, who goes into the open air after visiting a small-pox patient, seldom

if ever communicates the disease. Experiments were made in 1832 for the purpose of determining the power which chlorine possesses to destroy the contagion of small-pox, and likewise the effects of a very high temperature in disinfecting bedding and clothes, but the results were unsatisfactory.

The peculiar miasm or morbid germ of small-pox is given off both by the skin and the lungs. It possesses a peculiar odour. It may be received into the human body in three ways. 1. It may be diffused through the air, and enter the system through the medium of the lungs. This is called the mode of *infection*. 2. The matter of the pustules, or a scab, may be applied to the unbroken surface of the skin, or to the mucous membrane of the nose, and be thus absorbed. This is strictly called the mode of *contagion;* but it must be admitted that the terms contagion and infection are often used indiscriminately to express the silent, or, as we say, *casual* reception of the germ. Lastly, small-pox may be taken by applying the fluid matter to a wound of the cutis, and thus causing its certain absorption. This is called the mode of *inoculation*, of which we shall treat at large hereafter.

2. The epidemic origin of Small-pox.—The facts which *prima facie* suggest the notion of an atmospheric origin, and which, at any rate, serve to associate small-pox with the large tribe of epidemic disorders, are the following:—

Small-pox, at particular times, spreads with extraordinary facility over a certain district of country. Its ravages, in these epidemic visitations, increases for a certain length of time, attain their crisis or height, and then gradually recede. Attempts have been made to fix the periods of epidemic visitation, and while some have stated seven, others have named fourteen years as the most common interval. The greatest epidemic years experienced by the present generation in England, have been 1781, 1796, 1825, and 1838. The intervals here have been fifteen, twenty-nine, and thirteen years, but on various intermediate occasions small-pox has prevailed, though with less intensity. On the last occasion, the epidemic began in London in November, 1837, reached its height in June, 1838, and finally ceased in January, 1839. A course nearly similar was observed in each of the three preceding years of extensively epidemic small-pox. It has been attempted to connect the occurrence of small-pox on such occasions with some unusual condition of the atmosphere, but in vain. Nothing peculiar has been observed, either with regard to the heat or dryness of the seasons, or the state of the winds, in those years. Neither the thermometer nor barometer helps to explain the phenomenon. Small-pox sometimes spreads in a fine clear atmosphere, sometimes in a cold and moist state of the air. The frosts of winter and the heat of summer are alike congenial to it. It is not an unreasonable supposition, that the phenomenon may depend on some peculiarity

in the *electrical* condition of the air, which science may hereafter detect. It is known that, in epidemic years, not only is small-pox more general, but it is of a more aggravated character, and consequently more fatal. There are grounds for supposing that at such times the *sphere* of contagious influence is much widened. Dr. Haygarth, who took great pains to investigate this matter, believed that the distance to which the contagious effluvium extends beyond the person of the individual affected, was in all cases alike, and always very limited, not exceeding a few feet. There is reason to suspect, however, some fallacy in these observations. It is very difficult, undoubtedly, to determine with accuracy the distance at which the poison ceases to be energetic, but it is almost certain that the constitution of the air, in epidemic years, permits a very wide diffusion of the variolous germ. It is supposed by some that this diffusibility is the very essence of that principle which we designate as the epidemic constitution of the atmosphere. But this cannot be all; for it is often noticed that persons (vaccinated persons, for instance) who resist small-pox in common years, though fully exposed to the contagion, are attacked by it in years of epidemic prevalence. These and other facts, which bear on the epidemic origin and diffusion of small-pox, were overlooked by those sanguine pathologists, who imagined that in vaccination Nature had provided us with means adequate for the complete extermination of small-pox from the earth.

Susceptibility of Small-pox.—All mankind, with few exceptions, are born with a susceptibility of small-pox. This susceptibility, unless altered by vaccination, remains, for the most part, equally strong at all ages; though sometimes, from accidental causes, a particular individual shall take it at one period of life, and resist it at another. Persons have been known to go through a long life, exposed frequently to the contagion of small-pox, and yet never take it casually. The same persons have received the disease by inoculation at an advanced age. A lady was successfully inoculated for small-pox at Salisbury, in 1804, when eighty-three years of age. She had brought up a large family. A few persons pass through life apparently insensible to the variolous virus, whether exposed to it casually or by the mode of inoculation. These cases, however, are exceedingly rare. The power that vaccination possesses to lessen this susceptibility, and to protract the period of receptivity, or, in the opinion of some, to destroy the susceptibility of small-pox in the human frame altogether during the whole subsequent term of life, is a subject which will be discussed in a future page. An immunity from small-pox is said to be a peculiarity in some families, but there is little foundation for such a notion. The circumstances which (independent of vaccination) render a person, either through life, or at particular periods of life, unsusceptible of small-pox, are not well known. Some-

thing may depend on the state of the recipient, something on the equality or intensity of the effluvium.

Recurrent Small-pox.—In the greater part of mankind, one attack of small-pox gives immunity from future attacks. The virus, indeed, may again have access to the body, but neither fever is excited, nor any kind or degree of constitutional disturbance. Exceptions to this law have undoubtedly occurred. In all ages, from the time of Rhazes, who first described small-pox, its recurrence has been recorded; and of late years, from particular circumstances affecting the alleged power of vaccination, these cases have been brought prominently forward. It will be necessary, therefore, to inquire somewhat more accurately into the phenomena of recurrent small-pox.

The rarity of such cases may be inferred from the fact, that no instances are recorded of persons being received *twice* into the Small-pox Hospital; and the instances of alleged secondary small-pox, admitted into that institution, have been very few. Some physicians of the last century could with difficulty be persuaded that such cases ever occurred. Heberden estimated them at only 1 in 10,000; other writers, at 1 in 8000, or 1 in 50,000.

Sir Gilbert Blane (*Select Dissertations*) remarks, "that all the well-authenticated cases of second small-pox have been of persons who in the first instance had it severely." This would seem to connect the recurrence of small-pox with some peculiar proneness in the system to suffer under the variolous virus. Such a constitution is said to show a *variolous diathesis.* Other pathologists, again, have noticed that where second attacks have occurred, the first have been very mild. They have imagined, therefore, that the first attack was not in sufficient intensity to alter the whole mass of blood, or, in other words, absorb and destroy variolous susceptibility. It has been stated, that cases of *inoculated* small-pox are more likely to be followed by second attacks, than where the disease is received *casually:* but Baron Dimsdale, whose experience was great, denied the correctness of this statement.

Some cases have been recorded where the first attack had been in such intensity as to leave undisputed evidence of itself in the form of pits and scars, and it has even been said that occurring under such circumstances, a second attack has proved fatal. The interval between the two attacks is usually very long, extending to twenty or thirty years. In almost all cases, the two attacks vary in intensity; where the first attack was severe, the second proves of the mild, horny, or verrucous kind. On the other hand, where the first is light and varioloid, the second is comparatively severe. It ought not, however, to be forgotten, in forming an impartial estimate of the frequency of such occurrences, that many sources of error are to be taken into account. The attacks succeed each other at long intervals, and the real nature of the first attack is not always

easily ascertained. There are, too, as we have already shown, many diseases which resemble variola (such as lichen, varicella, porrigo, secondary syphilis), and a mistake may be made in truly designating the secondary as well as the primary attack. Without meaning to throw discredit on some of the recorded cases of double small-pox, we may, therefore, be permitted to doubt the correctness of others; and, at all events, it must be conceded that unequivocal cases of recurrent small-pox are rare. They have been, and will continue to be, objects of curiosity to the practical physician. We shall hereafter have occasion to recur to these doctrines, and to show that the attempts made to explain the occurrence of small-pox after vaccination, upon the same pathological principles as apply to recurrent small-pox, have totally failed.

It happens occasionally that a local effect is produced by the application of variolous matter to the body after it has fully undergone small-pox. Thus nurses who suckle children with small-pox, frequently exhibit small-pox pustules on the breast, and sometimes feverishness supervenes. Surgeons have unguardedly pricked their finger with the point of a lancet armed with variolous matter, and have suffered in consequence; but in these cases the affection is local, and the accompanying fever purely symptomatic.

All the cases which have been recorded of small-pox occurring a third or a fourth time in the same person may be set down as apocryphal.

VIII. TREATMENT.

The labour that has been bestowed in delineating the several varieties and modifications of small-pox, and in explaining the circumstances under which it shows itself, has been vain and profitless, if medicine be of no service in ameliorating the condition of the patient, and lessening the rate of mortality. Nevertheless it must be borne in mind, that the influence of medical treatment is much less manifest in this than in many other acute diseases. Improper treatment may, indeed, aggravate the danger, but it often happens that the most skillful treatment scarcely lessens it. It is a melancholy reflection, that for many hundred years the interference of the physician, often thwarting but seldom aiding the efforts of nature, was calculated to diminish rather than to increase the chance of the patient's recovery. Before entering on the curative treatment of small-pox, therefore, it will be proper to recall to remembrance the peculiar nature of the disorder. It is a fever which *relieves itself* by superficial eruption. That eruption, even when too copious, cannot be diminished or checked in its progress by any efforts of art; when moderate, it requires not the interference of the physician. His efforts should be confined, 1, to moderating the

arterial excitement when too abundant; 2, to supporting the vis vitæ where it obviously flags; 3, to the relief of urgent and oppressive symptoms, which may incidentally arise in any of the three stages of invasion, maturation, and decline. *Heroic* remedies are here wholly inapplicable, and the great object of art is simply to place the system under the most favourable circumstances for effecting what the old physicians called the concoction and elimination of the morbid humour. An historical survey of the methods of treatment pursued in small-pox, presents a succession of measures, which it is the boast of modern medicine to have abandoned. The hot regimen, bleeding, opiates, stimulants, blisters, and unguents, have been in various ages of the world brought forward as means of undoubted power in the cure of small-pox. The object of the physician in modern times has less of pomp, but more of true philosophy about it. He is content if he can keep within due bounds the action on the surface; if he can check the congestions and inflammations which occasionally supervene in internal parts; and, lastly, if he can support the system under protracted fever, and the exhaustion consequent on extensive pustulation.

1. The initiatory stage. When the nature of the approaching disorder is unknown, the treatment must necessarily be adapted to the character of the symptoms present. Where it is suspected to be small-pox, the following rules apply. The antiphlogistic regimen is to be pursued as far as the case admits. The surface is to be kept moderately cool. Where pain of the epigastrium, or of the back, or of the head, is very urgent, blood may be taken from the arm, the amount being regulated by the fullness and force of the pulse. Leeches applied to the temples afford great relief to the headache, where the general character of the circulation forbids general blood-letting. A brisk cathartic, composed of three or four grains of the chloride of mercury with eight of the compound extract of colocynth may be advantageously given to moderate the tumult of the general system. Saline draughts in a state of effervescence may be taken frequently, and the addition of a pill containing two or three grains of James's powder serves to direct the fluids to the surface. Coldness of the extremities will be met by hot bottles to the feet, the pediluvium, or mustard poultices. A languid circulation requires the aid of stimulants, such as camphor julep with ether, wine, or brandy and water. Great restlessness must be quieted by an opiate conjoined with antimonial wine.

It has often been said that blood-letting, in the fever of invasion, interrupts the process of nature, retards or altogether repels the eruption, and so weakens the system as to prevent the due maturation of the pustules. On the other hand, some writers have maintained that free blood-letting, at this stage of small-pox, is the

only measure which can effectually lessen confluence, and prevent the development of pustules on the mucous expansion of the mouth and throat. Both these opinions have been taken up in ignorance of the real value of blood-letting at this stage of small-pox, and of the mode of its operation. Blood-letting has no influence on the quantity of eruption, whether cutaneous or mucous. Again, while it sometimes, when incautiously practised, retards the eruption, it as often hastens and encourages it. The eruptive process is frequently impeded by the violence of the febrile commotion, and the oppressed state of the great internal organs, the brain, the heart, and the lungs. Whenever these organs are gorged, and their functions interrupted by a load of stagnant or inflamed blood; where intense headache, extreme irritability of stomach, oppressed breathing, and a full labouring pulse give evidence of such general or local congestion, the loss of blood proves the safest and the surest diaphoretic. To bleed, however, merely because small-pox is anticipated, with the view of preventing confluence, is uselessly to waste that power which will be required for the repair of extensive injury to the surface. The physician will carefully consider all the circumstances of the case, and, keeping these general principles in view, endeavour to promote eruption and diminish internal congestion, without materially impairing constitutional power.

2. The maturative stage.—While the pustules are in process of maturation, a variety of measures may be pursued, which, without interfering with the salutary and necessary process of pustulation, lessen the patient's suffering, and prevent subsequent difficulties.

When the eruption comes out tardily, with continuance of sickness and vomiting, the pulse being small and thready, mustard poultices or a blister may be applied to the epigastrium, and hot bottles put to the feet. The bowels should be relieved by stimulating injections, and the stomach quieted by small doses of an opiate repeated at short intervals. When the patient complains of great pain in the throat, with difficulty of swallowing, leeches may be put on the throat, and the bleeding encouraged by fomentations of poppy-heads and camomile flowers. When the surface is very tender and painful to the touch, cooling lotions may be applied; and in distressing cases, a few leeches will be found the only effectual means of diminishing the local inflammation on which the symptom depends.

The condition of the internal organs will require constant superintendence and regulation during the whole period of maturation, more especially in all cases possessing, or approaching to the character of confluence or semi-confluence. When the pulse is sharp, and the skin hot and dry, purgative medicines must be administered daily. They may consist of senna and salts, or the compound powder of jalap, or castor oil, or of calomel and colocynth, or calomel

and jalap, according to the urgency of the symptoms, and the peculiar habits of the patient. The action of the kidneys is to be encouraged by frequent doses of the citrate of potash in effervescence, or of the liquor ammoniæ acetatis, or of any similar mild diuretic. When cough and copious expectoration of mucous or muco-purulent matter, with increasing dyspnœa, give evidence that the lungs, or smaller ramifications of the bronchia, are taking on inflammatory action, blood must be taken from the arm to the extent of fourteen ounces, and full doses of antimonial wine with mucilage added to the saline draught. When headache, a flushed face, redness of the eyes, and strong beating of the carotid and temporal arteries accompany a state of delirium, it will be requisite to draw blood from the arm, to apply leeches to the temples, and purge the bowels freely by calomel and jalap. The mere occurrence of delirium in small-pox is not, however, *per se*, an adequate ground for blood-letting. Delirium is often present when the pulse is small, and the conjunctiva shows no increased vascularity. Delirium of this kind will abate as the cutaneous inflammation advances to its crisis. Great care should, however, here be taken to protect the patient from self-injury.

In this, and, indeed, in all cases of small-pox of the least severity, it will be proper, from the very first period at which the disorder becomes manifest, to direct the hair to be cut close, and so maintained throughout the whole course of the disease, and for several weeks afterwards. The head is thus kept cool; delirium is relieved, or prevented; the danger of cellular inflammation of the scalp diminished; the chance of ophthalmia lessened; cleanliness enforced. For such great advantages, the finest head of hair should be sacrificed. Ophthalmia occurring during the maturative stage is to be combated by leeches to the temples, an active purgative of calomel and jalap, and the local treatment recommended under *Variolous Ophthalmia*. In all cases it is desirable that the patient should be kept in a darkened chamber. His room should be large and airy. His diet should consist of milk and bread, arrow-root, oranges, ripe fruits, and roasted apples. His drink may consist of toast and water, milk and water, whey, tamarind-water, apple-tea, and lemonade. Sydenham's favourite beverage at this stage of the disease was small-beer, which may safely be allowed.

When the irritation on the surface is very great, and the nights are restless, an opiate may be given with great advantage at bed-time. It may consist of thirty drops of laudanum, or ten grains of Dover's powder. An aperient draught the following morning should not be omitted.

When small-pox is associated with that train of symptoms which constitutes acute malignancy (or a dissolved and putrescent state of the fluids), the influence of medicine is scarcely to be recognized. Acids are usually administered mixed with the decoction and tincture of bark, with a view to augment the crasis or coagulating

power of the blood. Ether, camphor, port-wine, brandy, and other stimulants are to be given in quantities proportioned to the wants of the system. Astringents are of no avail. Much attention has been paid in all ages to the *local* treatment of the pustules. The practice of puncturing the pustules, and draining off their contents, was begun by the Arabians, and has been often recommended since, on the plea that danger was to be apprehended from the absorption of matter. This opinion, however, is founded on a pathological error, and the practice is now abandoned by those who test its efficacy on a large scale.

The French have more recently introduced the plan of cauterizing the vesicles in an early state, so as to prevent their subsequent development. In the corymbose form of small-pox, where a cluster of vesicles has formed near the eye, some benefit may be derived from the adoption of this remedy; but it is inapplicable to a case of universally confluent small-pox, and it is unnecessary in the milder varieties of the disorder. Some recent observers state that mercurial plasters, composed either of calomel or of corrosive muriate, have the power, when applied to the skin, of so modifying its condition, as to prevent the maturation of the pustules. Applications composed of calomel, however, possess no such power. Those composed of corrosive sublimate occasion great irritation, and convert a mass of confluent vesicles into one large and painful blister, but it would be unreasonable to expect benefit from such a change. The practice has therefore been silently abandoned.

[The *ectrotic*, or abortive method of treating the eruption by cauterization of the individual pustules, recommended by Bretonneau, Serres, and Velpeau, is available only when the eruption is discrete, and from its difficulty and the pain it produces, it should be confined to those parts where it is important to prevent cicatrices. Practised on the first or second day of the eruption it instantly arrests its further progress, and, according to MM. Rilliet and Barthez, frequently succeeds when delayed to the third, fourth, or even fifth day. "The inflammation," observe those authors, "as well as the pustules, is cut short, at least this effect has invariably followed cauterization of the pustules on the margins of the eyelids. It is almost incredible how rapidly the œdema of these parts disappear." Zimmermann, Rosen, and others, had remarked the influence which mercurial plasters exerted in arresting the progress of the variolous pustule. The fact, however, seemed to be forgotten, until Dr. Serres, and afterwards Drs. Briquet and Nonat, called the attention of the profession in France to the favourable results of the experiments which they had made with mercurial applications in the treatment of small-pox. According to Dr. Briquet, whose memoir* is the most complete yet published on the subject, if the

* [Archives Générales de Médecine, Octobre, 1838.]

face or other parts of the body are covered with mercurial plaster, during the first, second, or not later than the third day, suppuration is arrested, and the resolution of many of the pustules is effected: the others are converted into vesicles or tubercles. The mercurial plaster of the French Codex, or *Emplastrum de Vigo cum Mercurio*,* spread upon some coarse stuff, stiff enough to support itself, is the application recommended and employed, whilst a little mercurial ointment is applied to the eyelids and nostrils, the plaster not being readily kept on these parts. It is allowed to remain three days in simple small-pox, and a day longer in the confluent variety. MM. Rilliet and Barthez, to meet the difficulty of maintaining the due application of the plaster in children, use the following cerate as a substitute.—Mercurial ointment, 24 parts;—yellow wax, 10 parts;—black pitch, 6 parts. M. Professor Wood states that he has used the mercurial ointment of the United States Pharmacopœia, with success in a very bad case of small-pox.† Dr. Goblin‡ states that during a recent epidemic at Stains, he observed great benefit from the use of mercurial ointment, in arresting the progress of the pustule, and removing surrounding inflammation. He used it stronger and more frequently in proportion as the eruption had a tendency to become more confluent: its use was continued for several days. Dr. Stewardson, who tried the practice in the Philadelphia Small-Pox Hospital, states that he feels satisfied, "from the experiments there made, that the mercurial plaster exerts a decided influence upon the pustules, preventing more or less their perfect maturation, and diminishing the concomitant inflammation, swelling, and soreness. I did not find that it prevented pitting altogether, but only that it lessened the liability to it. Independently, however, of its influence in this respect, the application of the mercurial plaster to the face, is valuable in some cases, with the view of moderating the inflammation, as the patient is thus relieved of considerable swelling and pain, as well as from the inconvenience arising from the formation of thick scabs. The strong mercurial ointment was used in some cases, whilst in others it was rubbed down with an equal bulk of lard. It was spread upon a piece of thick muslin shaped like a mask, and then carefully applied to the forehead and face."§ The plasters should not be allowed to remain on after the fourth day, as softening of the base of the vesicles may ensue and cicatrices be formed. Slight erysipelas has been occasionally observed, and a limited eczema is more frequently produced, but it soon passes off and is of little consequence. That the power of promoting the maturation resides in the mercury is evident from

* [United States Dispensatory, 5th ed., p. 916.]
† [Ibid.]
‡ [Revue Médicale, Juin, 1845.]
§ [American Journal of Medical Sciences, January, 1843, and Elliotson's Practice of Medicine, Am. Ed. p. 438.]

the fact that plasters of lead had no effect in changing the nature of the eruption, and the pustules were developed as freely under adhesive plaster as upon the free surface of the skin. Larrey, on his return from Egypt, recommended the application of gold leaf, previously smeared with gum Arabic mucilage. Some experiments performed in New Orleans by Dr. Picton would prove that the exclusion of light is an effectual means to prevent pitting. A number of patients were placed in a dark ward of the hospital during the eruptive stage of the disease, and though some of them had the disease violently and of the confluent form, no deformity of the skin was observable. The tincture of iodine repeatedly applied to the pustules, at an early period, has been recommended by Dr. Samuel Jackson, of this city, and formerly of Northumberland.]

3. The secondary Fever.—The decline of the mild forms of small-pox requires little else than attention to the state of the bowels, and care lest a too great indulgence of the appetite should engender feverish excitement. A warm bath is advisable before the patient is permitted to mix again with the world.

Where secondary fever sets in with any of those complications formerly described, the means of relief must be adapted to the peculiar circumstances of each case. The rules applicable to the treatment of fever generally apply here, but the following principles may be kept in view.

When the pustulation is profuse over the whole body, the strength of the system is to be supported by nourishing diet, an allowance of ale and porter, and gently cordial medicines. These cases usually end favourably, though the exhaustion may be great, and the convalescence very tedious. On the other hand, when the skin dries up, and fever rages in the mass of blood, the greatest attention is required to prevent local congestions, or to check them when they arise. The patient is to be kept upon a low diet, saline medicines are to be diligently administered during the day, a purgative draught is to be directed every morning, and the first appearance of local disorder is to be met by its appropriate treatment. A very absurd dread of purgative medicines in both the maturative and secondary stages of small-pox has influenced the minds of many practical physicians. It is difficult to imagine how it could have arisen, for the value of purgatives is fully as manifest in small-pox as in any other acute disease.

The period of secondary fever is often accompanied with symptoms of extreme debility. The pulse is scarcely to be felt. The tongue is covered with a dark fur. The skin is cold. The expression of countenance is truly typhoid. Subsultus tendinum, and general tremors, further indicate the great exhaustion of nervous power. The most powerful stimulants are now demanded. Wine must be administered liberally, and the medicine should be composed of ether, the subcarbonate of ammonia, and an aromatic tincture in camphor julep.

Erysipelas succeeding small-pox must be treated simply with reference to the accompanying state of the circulation. Sometimes it is best combated by purgatives and saline diaphoretics; at other times wine and tonics are obviously indicated. Variolous ophthalmia is, of all the various sequelæ of small-pox, the most difficult to manage. The loss of blood which the intensity of the symptoms appears to warrant would speedily be followed by great and perhaps irremediable exhaustion. Leeches, cupping-glasses to the temples, calomel and opium, active aperients, and warm fomentations, afford a better prospect of eventual benefit. In some cases, the eye must be sacrificed to save the patient's life. Variolous pleurisy demands the loss of blood from the arm, the application of warm fomentations to the side, and a steady perseverance in the use of that powerful diaphoretic, which is presented in the combination of calomel, James's powder and opium.

The management of the pustules in the stage of desiccation and decline has been as much an object of attention as their treatment in an earlier period. When the pustulation is profuse, it is very requisite to apply liberally some simple dry powder to absorb the discharge; hair powder, starch powder, the powder of calamine, and well-dried flour, are alike available for this purpose. Cold cream and mild unguents (such as the ung. cetacei, with a proportion of oxide of bismuth) are useful when there is much cutaneous irritation with a dry surface. The efforts so frequently made in former times to prevent pitting, by means of masks and divers ointments, ended generally in disappointment. The only means which can be relied on for preventing such disfigurement, are those which allay general cutaneous excitement. Purgative medicines and low diet, therefore, are those which best deserve our confidence.

When small-pox has called into activity the scrofulous diathesis, the utmost efforts of the physician will be required, but often with very indifferent success. A course of sarsaparilla is sometimes beneficial. Occasionally, moderate doses of mercury (in the form of blue pill, or of the hydrargyrum cum cretâ) will improve the secretions, and with them the general health. But the remedy of most unquestionable efficacy is change of air; it imparts tone to the languid cutaneous vessels, converts an ecthymatous surface into healthy granulations, improves the appetite, and diminishes the strumous irritability of the retina. The influence of an altered air on the diseased actions of the body is better displayed in the sequelæ of small-pox than in any other known disorder.

VARIOLOUS INOCULATION.

The universality, severity, and mortality of small-pox have been such as to stimulate the minds of men to the discovery of means whereby the ravages of this frightful disease might be in some measure controlled. Two measures have been devised for this purpose. The one was invented about the beginning of the eighteenth century, in Turkey; this is Variolous Inoculation. The other was discovered in England towards the close of the same century by Dr. Jenner; this is Vaccination. Both discoveries are wonderful efforts of the human mind, unfolding the secret but beneficent provisions of Nature for the mitigation of her most baneful pestilence.

We shall begin with inoculation; tracing first its origin and subsequent diffusion, then describing the mode of conducting the process, and concluding with some reflections on its value.

I. HISTORY.

It is an extraordinary circumstance, that the ingenious inventor of this mode of mitigating small-pox should be unknown. It has been conjectured that it had its origin in the Turkish provinces bordering on the Black Sea (Circassia and Georgia), and that it was first adopted for the purpose of securing the beauty of female slaves; but this opinion is not borne out by any adequate authority. It is rather believed to have been first practised in the Morea. Still less reliance can be placed on the statements put forth as to the antiquity of this practice in China and Hindostan. All that we know for certain is, that the first accounts of inoculation came from Constantinople, and there, towards the close of the seventeenth or commencement of the eighteenth century, small-pox inoculation must be considered to have originated.

In the year 1703, rumours of the great success attending this new operation reached the ears of Dr. Emanuel Timoni, a Greek physician, who, after studying and graduating at Oxford, had settled as a physician in Constantinople. Convinced, by considerable experience, of the importance of the discovery, Dr. Timoni, in 1713, communicated the facts to Dr. Woodward, by whom they were in turn communicated to the Royal Society of London in 1714. In 1715, Mr. Kennedy, an English surgeon, who had traveled in Turkey, published an account of the new mode of inoculating small-pox, in his *Essay on External Remedies*. In the same year Dr. James Pylarini, the Venetian consul at Smyrna, published the accounts which had reached him of this novel practice. A notice of his work appeared in the *Philosophical Transactions* for 1716. These curious and important facts were, however, altogether overlooked by the British physicians of those days, and

might have been still longer neglected, but for the talent and energy of a lady, the celebrated Lady Mary Wortley Montague, wife of the English ambassador at Constantinople. Her spirited and often quoted letter (*Letters of Lady M. W. Montague*, vol. ii.), dated April 1, 1717, thus describes the new process:—

"The small-pox, so general and so fatal amongst us, is here entirely harmless by the invention of ingrafting, which is the term they give it. There is a set of old women who make it their business to perform the operation every autumn in the month of September. Every year thousands undergo this operation; and the French ambassador says pleasantly, that they take the small-pox here by way of diversion, as they take the waters in other countries. There is no example of any one who has died in it; and you may believe I am well satisfied of the safety of this experiment, since I intend to try it on my dear little son. I am patriot enough to take pains to bring this useful invention into fashion in England."

The introduction of inoculation into England proved, however, a more difficult task than Lady Mary had expected. Nothing short of the spirit and enterprise of such a woman could have succeeded in overcoming the prejudices which prevailed equally in the public and the medical profession at that time. On the return of Lady Mary to London, in April, 1721, her daughter was inoculated, the first example of inoculation in England. The experiment was then tried on six condemned criminals in Newgate. (*Woodville's History of Inoculation.*) These and some other trials being deemed satisfactory, the Princess of Wales consented that her daughters, the Princesses Amelia and Caroline, should be submitted to the process, the former being then eleven, and the latter nine years of age. Their inoculation took place on the 19th of April, 1722. They both passed through the disease in a very favourable manner; but the new practice, commenced under such brilliant auspices, received a severe check immediately afterwards, in the death of the Hon. W. Spencer, son of Lord Sunderland, and in that of the butler of Lord Bathurst, both of whom were inoculated in April, 1722.

In June, 1721, inoculation commenced in America, under the direction of Dr. Boylston of Boston. Between that period and the end of January, 1722, 244 persons were inoculated by him, of whom six died. The subjects, however, were ill chosen, and the operator displayed as much ignorance as rashness. The news of this disaster reached London at the very time when the public mind was agitated by deaths in two of the noble families of England, occasioned by the new practice; and it is not surprising that, under such circumstances, inoculation should have been generally discountenanced. In fact, so little progress did it make, that between 1721 and 1729, the total numbers inoculated were only 897,

of whom 845 went through true small-pox, 13 exhibited an imperfect effect, in 39 the operation failed altogether, and 17 died.

In other countries, the new practice found more favour than in England; and when, in 1738, these facts became known, its reputation in this country was gradually restored. It was not, however, till the middle of the century, that the practice of inoculation was at all general. Several circumstances contributed at that period to give a favourable bias to the public mind. In 1746, the Small-pox and Inoculation Hospital was founded, for the avowed purpose of extending to the poor benefits which had hitherto been exclusively confined to the rich. In 1747, Dr. MEAD, then the most popular of the London physicians, published his work *De Variolis et Morbillis*, and devoted a chapter to the recommendation of inoculation. In 1754, the Royal College of Physicians of London sanctioned the practice by an official document; and in 1755, the excellent *Memoir on Inoculation*, by M. DE LA CONDAMINE, (first published in Paris in 1754,) appeared in an English dress.

A new era in the history of inoculation commences with the introduction and general adoption of the Suttonian practice in 1763. ROBERT and DANIEL SUTTON were sons of Mr. ROBERT SUTTON, surgeon, of Debenham in Suffolk, who had acquired some fame as a successful inoculator. Both sons followed their father's profession. The one established himself at Bury St. Edmunds, the other at Ingatestone in Essex. Both were in repute, but the success of Daniel at Ingatestone was surprising. It was a success fairly earned by the boldness and dexterity of his management. The following appear to have been the chief merits of the Suttonian system of inoculation. 1. The tedious preparatory process advised by his predecessors was curtailed from a month to a week. 2. He prepared the system by a course of antimonial and mercurial purgatives. 3. He inoculated by a single puncture, instead of the numerous incisions and clumsy modes of introducing the virus which had been in use before his day. 4. He had great tact in the selection of good lymph for inoculation. 5. He exposed his patients freely to the coldest air, both prior to and during the progress of the inoculation. 6. He inculcated the necessity of a spare diet and cooling drinks. The merit of the SUTTONS was disparaged because there was nothing new in all this. The Turkish children, it was said, were allowed to continue at play. SYDENHAM had taught the value of the cooling regimen. The Americans had employed a mercurial purgative. This, however, does not take off from the merit of DANIEL SUTTON, whose clear and comprehensive mind selected what was good, and rejected the faulty parts of his predecessors' practice.

BARON DIMSDALE succeeded to the popularity and extensive practice of the SUTTONS. In 1766, he published the first edition of his valuable work, (*The present Method of Inoculating for the Small-pox*,) containing all the essential parts of the Suttonian plan,

avowedly taken from the practice of DANIEL SUTTON, together with the results of his own experience. This work passed through six editions, and became the standard book on inoculation. No further improvements took place. The confidence of the public in the safety and efficiency of inoculation augmented annually; and in the year 1798, all the upper ranks of society in this country, and a considerable proportion of the lower, received the small-pox in this way. In June, 1798, Dr. JENNER announced the discovery of vaccination. In two years afterwards the general practice of inoculation declined. In 1808, it had almost gone out of use, and has never since been revived.

II. PRACTICE OF INOCULATION.

Inoculation is performed by introducing into the arm, near the insertion of the deltoid muscle, by means of a lancet, a minute portion of thin or crude variolous lymph. Well-digested *purulent* matter may also be employed. One incision is sufficient. On the second day the wound, under the microscope, presents the appearance of a minute orange-coloured spot. On the third or fourth day, the patient experiences the sensation of pricking in the part; the punctured point is hard, and a minute vesicle, with central depression, may be observed, surmounting an inflamed base. On the fifth day the vesicle is well developed. On the sixth day the patient feels stiffness in the axilla, with pain. The inoculated part has become a hard and inflamed phlegmon. The subjacent cellular membrane is involved in the inflammatory action. On the evening of the seventh, or early in the eighth day, rigors, headache, vomiting, offensive breath, alternate heats and chills, languor, lassitude, and perhaps in a child an epileptic paroxysm, announce the setting in of fever. The constitution has taken alarm, and sympathizes with the progress of the local disorder.

After the appearance of febrile symptoms the inflammation of the arm spreads rapidly. An areola of irregular shape develops itself, in which minute confluent vesicles may be traced. The areola continues to advance till the tenth or eleventh day, when the arm is hard, tense, shining and very red. The pustule discharges copiously. On the eighth or ninth day, spots of variolous eruption show themselves in various, and often in the most distant, parts of the body. The eruption is generally distinct, and moderate in quantity. The papulæ can generally be counted without difficulty. One hundred or two hundred are considered a very full crop. Occasionally not more than two or three papulæ can be discovered, which sometimes shrivel and dry up without going through the regular process of maturation. At other times, the eruption is full, and semiconfluent, passing through all the stages of maturation, pustulation, and cicatrization, as perfect as in the casual disease. Between these extremes, every possible variety may be observed.

The true confluent eruption with cellular complication is, however, rare. Still rarer is the affection of the mucous membranes; and that implication of the fluids, which constitutes a malignant small-pox, is scarcely ever observed to succeed inoculation. Secondary fever, therefore, and its consequences, are very seldom met with.

It often happens that on the eighth or ninth day prior to the eruption of the genuine variolous papulæ, the body is overspread with a rose-coloured efflorescence (*Roseola exanthematica* of authors). In a day or two, distinct papulæ may be detected amidst the general redness. The rash then declines, and the papulæ pursue their regular course. This variolous roseola is said to occur in about one case in fifteen of inoculated small-pox. It is the indication of a mild and favourably disposed eruption. It often precedes, in like manner, the mitigated form of small-pox, as it occurs casually, with or without preceding vaccination.

The following rules and cautions for the safe performance of inoculation have been laid down by the best authors, especially Baron Dimsdale, and they come recommended to us, as well by their own reasonableness, as by the results of long and successful experience. 1. Inoculation should be performed exclusively in persons free from actual bodily disease, not plethoric, and, so far as possible, in persons of sound constitution, without tendency to scrofula. 2. Inoculation may be safely practised at all ages, but some discrimination is of course necessary to insure a successful result. Infants may be safely inoculated about the fourth month, before the process of dentition has actually commenced. Children are also in a fit state for inoculation from the second or third year of life to the period of puberty. Adults, whose blood is not inflamed by spirituous liquors or excessive exercise, may be safely inoculated. 3. It is improper to inoculate during the period of pregnancy, partly from the condition of the maternal blood, but chiefly from the danger of affecting the child. 4. Inoculation may be practised at all seasons, and in all climates. Baron Dimsdale noticed a greater abundance of pustules in spring, than at any other season of the year. It proved not less successful in the West Indies than in Russia. 5. Whatever tends directly or indirectly to diminish plethora, to moderate arterial excitement, to lessen determination of blood to the skin, to clear the bowels of offensive sordes, to regulate the secretions generally throughout the body, and to preserve the blood in a cool and healthy condition, is useful in the conduct of inoculation. Perfect health being the best condition for receiving and safely eliminating small-pox, whatever tends to improve the health, increases the chances of eventual safety. Hence arises the necessity of preparing the body, in certain cases, by a mild diet, cathartic or gently laxative medicines, abstinence from all violent exercise, and all indulgence in heating of spirituous liquors. Hence, too, we may deduce the importance of cool chambers, light clothing, and sometimes free exposure to the external air, in the management

of inoculated small-pox. 6. The exhibition of antimonial and mercurial medicines, not for the purpose of regulating secretions, but with a view to produce a state of body especially favourable to the reception of small-pox, is a useless and idle ceremony. The Suttons made this part of their plan; but Sir George Baker, Dr. George Fordyce, and, latterly, Baron Dimsdale, saw the absurdity and quackish nature of the scheme, and denounced it as frivolous and vexatious. Preparation to persons in sound health is unnecessary, for a man cannot be better than well; but while we disregard unmeaning ceremonies, let it not be forgotten that much caution is requisite when we form a judgment of the state of the blood and secretions (or humours) in any person, particularly in an adult. 7. Some differences of opinion exist as to the degree of importance to be attached to the selection of the lymph with which the inoculation is to be performed. Common sense would dictate the propriety of such precaution, and would suggest, as the fittest matter, such as is taken from a person of sound constitution, where the disorder is running its regular course, and it is of the mild or benignant kind. That these precautions have often been neglected with impunity, that severe cases have followed the use of carefully selected lymph, and *vice versâ*, that mild cases have resulted from the insertion of matter from confluent pustules, is undoubted, and, therefore, too much stress should not be laid on the selection of matter, but it is unreasonable to disregard it altogether. The Suttons preferred the crude or early lymph taken from a primary inoculated vesicle. It is agreed on all hands, that the *lymphatic* or crude matter of the fifth and sixth days is superior in efficacy and certainty of effect to the purulent or well-concocted matter of the eighth and ninth days.

Lastly, the *treatment* in inoculated small-pox must be guided by the same principles which have been laid down as applicable to the casual disease. A few doses of mild laxative medicine will be useful. The propriety of continuing a mild and unirritating diet is obvious. No local application should be made to the puncture, unless inflammation should run high. In that case, cooling lotions to the arm, and a purgative powder containing calomel and jalap, should be employed.

III. VALUE OF INOCULATION.

Since the discovery of vaccination, it has been the fashion to cry down inoculation, and to exaggerate its defects. An impartial estimate of the value of inoculation may not, therefore, be well received, but it ought not to be omitted. It was one of the early objections to inoculation, that no reasonable argument could be afforded why the inoculated should prove so much milder than the casual small-pox, why so much difference of effect should result from the morbid germ being received into the system, through the

medium of the cutaneous absorbents. The circumstance is truly inexplicable, but it must not blind us to the facts. Much labour was bestowed by the statistical writers of the last century, in attempts to determine the average mortality of inoculated small-pox. The professed inoculators, perhaps, concealed or explained away some cases. The prejudices of others exaggerated the number of unsuccessful results. It must never be forgotten, that persons may be inoculated after imbibing the germ of the disease casually, and thus death may be unfairly attributed to inoculation. Persons, too, may die of other diseases contracted during the process of inoculation. Making due allowances for these sources of error, it may be stated that where due attention is paid to the selection of subjects, and the careful management of the disorder, not more than one out of five hundred cases will terminate unfavourably. There can be no question but that the ill success which attended the early inoculations in England, arose entirely from bad management, from careless selection, ignorance of the principles by which the practice should be regulated, and the most absurd modes of surgical treatment. The improvement in the rate of mortality, so remarkable when the practice fell into the hands of judicious men like Sutton and Dimsdale, is decisive of this question, and gives some idea of what the practice might have been brought to, had it continued to the present day, profiting by the increased attention now given to matters of detail, and the generally improved pathology of modern times.

It has of late years been much urged as an objection to inoculation, that small-pox was often taken casually after it, but this impression never prevailed during the period when inoculation was general. It may safely be said, that inoculation gave as complete and certain exemption from a second attack, as the casual disease itself. The two great objections to variolous inoculation are, 1. That it proves the exciting cause of other disorders, and more especially that it calls into activity the scrofulous taint. This is an evil inherent in the very nature of the process; but inasmuch as the inoculated is milder than the casual disease, by so much is the danger lessened, when that process is adopted.

2. The second great objection against the practice of inoculation, insisted on by almost all writers since the discovery of vaccination, is, that it perpetuates the foci of contagion, multiplies the sphere of their operation, and thus, in protecting the life of one individual, exposes to imminent risk the lives of others, who, personally less careful, are not the less deserving of the public care and attention. The argument is very specious, and certainly important; but it should not be received without some inquiry. Such an objection to inoculation was brought prominently forward on various occasions during the last century, and especially in 1777. Dr. Watkinson, Dr. Schwenke, and others, in that year, attempted to diminish its force, by pointing out how important a part epidemic influence

played in the diffusion of variola. They argued, that where such epidemic influence existed, the spread of small-pox would be equally great, whether inoculation were practised or not. On the other hand, when no such condition of the atmosphere prevailed, inoculation would be in this respect harmless. They may have overrated the value of this argument, but it must not be overlooked. The strongest proof of its force is, that in 1838, when inoculation was unknown in London, the admissions into the Small-pox Hospital exceeded those of 1781, when inoculation was universally practised; both being years of epidemic prevalence. Had inoculation been practised in London in 1838, its wider diffusion then would undoubtedly have been attributed to that source. Sir Gilbert Blane (*Med. Chir. Trans.*, vol. x.) has laboured diligently to prove this charge against inoculation by reference to the bills of mortality. He makes it appear that the proportion which the mortality by small-pox bore to the total mortality, increased during the last century from 78 in 1000 to 94 in 1000. From this he concludes, that "inoculation, by opening a new source for the diffusion of its virus, has actually been found to add to the general mortality of small-pox." A statement of this kind seems at first sight incontrovertible, but all arguments deduced from statistical researches must be received with limitations; and many circumstances concur to show the necessity of this in the present instance. In the first place, as Sir G. Blane himself candidly acknowledges, the general mortality has diminished; consequently, if the mortality by small-pox had remained stationary, the same result would have occurred. But, further, the population has vastly increased, and this must influence the result. Dr. Adams (*Inquiry into the Laws of different Epidemic Diseases*) has shown that a corresponding increase has taken place in other diseases not communicable by contagion. He further makes it evident, that, by a different mode of calculation, a diminution in the deaths by small-pox, since the more general adoption of inoculation, rather than an increase, may be made to appear. Thus, in the thirty years that elapsed between 1741 and 1770, there died of small-pox within the bills of mortality, 63,308 persons; whereas, in the next thirty years, (viz., from 1771 to 1800 inclusive,) when inoculation was general throughout London, there died only 57,268.

These considerations must convince any unprejudiced mind, that the argument against inoculation, drawn from its supposed tendency to augment and multiply the foci of contagion, is not so forcible as the opponents of inoculation invariably allege.

On a general review of all the facts bearing on variolous inoculation, we cannot refuse to acknowledge, that it was a most valuable discovery, and the process itself a merciful provision of Nature against the ravages of a frightful pestilence. Had not the discovery of Jenner occurred to interrupt the extension of the practice, it would probably have continued to this day, increasing yearly in

popularity. Whether it be ever destined again to occupy the thoughts of men, and to co-operate with vaccination in the general design of mitigating the severity of small-pox, is a question which, at the present time, it would be certainly premature, and perhaps unnecessary, to consider.

VACCINATION.

The second measure which has been devised for controlling the severity and limiting the ravages of small-pox is vaccination. The circumstances that paved the way to this great discovery are fully known to us from various sources, of which we must content ourselves with offering a brief outline.

I. HISTORY.

It is to the indefatigable zeal of Dr. Jenner, that the world is indebted for the discovery of vaccination. He appears very early in life to have had his attention fixed by a popular notion among the peasantry of Gloucestershire, of the existence of an affection in the cow, supposed to afford security against the small-pox; but he was not successful in convincing his professional brethren of the importance of the idea; and so distasteful did the subject of cow-pox become to them, that he was at length compelled to abandon all attempts to interest others in the inquiry. His own ardour, however, was undiminished, and for nearly twenty years he continued without interruption to follow his favourite pursuit.

In the progress of his investigations, Jenner was impressed with the practicability of propagating the cow-pox by inoculation, from the cow first, and subsequently from one human being to another, so as to perpetuate the disorder. This magnificent idea appears to have first occurred to him about the year 1780. It was long after this date, that Jenner first attempted, by actual experiment, to prove the truth of his speculations. So slowly did the philosophical mind of Jenner ripen into conviction, that he inoculated his own son with small-pox in November, 1789. It must be acknowledged, however, that opportunities of experiment were not easily found; the cow-pox was often absent from the dairy-farms for many years in succession. At length, however, the favourable opportunity occurred; cow-pox in an active state was found, and on the 14th of May, 1796, (commonly regarded as the birthday of vaccination), a child eight years of age was vaccinated by Dr. Jenner, with matter taken from the hands of a milker. He passed through the disorder in a manner perfectly satisfactory, and on the 1st of July

following, was submitted to variolous inoculation by way of test, but it took no effect.

Dr. JENNER still delayed publishing the result of his researches, that he might, if possible, strengthen his case by additional experiments. This he did in the spring of 1798; and in June, 1798, put forth his original essay, *Inquiry into the Causes and Effects of the Variolæ Vaccinæ.*

In this work, JENNER treats first of the causes of small-pox. He traces the disorder in the cow to contamination from the horse, where it appears in the foot, and is known to farriers by the name of *the grease.* The hands of the milkers and farm servants are stated to be the medium of communication. He intimates, that small-pox itself may be a poison of the same nature, aggravated by accidental circumstances into a malignant and contagious disease; and he announces his conviction, that cow-pox, when it has once passed in a perfect form through the human body, leaves the constitution for ever after secure from the infection of small-pox. Sixteen cases of the casual or natural cow-pox, and seven of the inoculated disease, are detailed. In this Essay, JENNER nowhere hints at the possibility of his plan ultimately exterminating the small-pox, nor does he propose the abandonment of inoculation, but he modestly suggests the probability of its usefulness in persons who, from family predisposition or otherwise, may be presumed liable to take small-pox severely.

It is difficult to imagine a work better calculated from its tone, and object, and cautious recommendations, to attract and fix the public attention. A strong and irresistible impression in favour of cow-pox became general, and vaccination at once popular; and medical men (with few exceptions) became everywhere its strenuous advocates and supporters.

Stimulated by success, Dr. JENNER soon after threw off the reserve manifested in his first publication, and loudly announced that cow-pox possessed powers adequate to the extirpation of small-pox from the earth. In May, 1801, within three years after the first announcement of the discovery, he writes thus: "It is now too manifest to admit of controversy, that the annihilation of small-pox, the most dreadful scourge of the human species, must be the final result of this practice." The brilliant prospect thus held out, added immeasurably at the time, and for many years afterwards, to the splendour of JENNER's fame; but it has been the occasion of all the anxieties and disappointments since experienced; and it would perhaps have been better, if the cause of vaccination had been trusted to the more cautious statements put forth in JENNER's original Essay.

The advances made by vaccination were rapid almost beyond belief. In 1801, Dr. JENNER states that 6000 persons had been vaccinated, the greater number of whom had been tested with small-pox, and subsequently exposed to infection, without effect.

In 1799, the practice of vaccination commenced in America; and in the same year, the most eminent physicians and surgeons of London signed a strong testimonial of their confidence in the virtues of cow-pox. In 1800, vaccination was introduced into France, and spread rapidly over the whole continent. In 1802, it commenced in Hindostan, and was thence propagated over every part of the continent of Asia. The parliament of England voted to Dr. JENNER 30,000*l.* as a reward for his discovery, and his generous devotion to the public welfare. Dr. JENNER died in 1823, at Berkley, the scene of his early labours, full of years and honours. During the latter years of his life, he devoted much of his time to the subject of vaccination, but he never wrote much concerning it subsequently to 1803.

It is now necessary to advert to some of the circumstances which clouded the brilliant prospect with which vaccination began. In 1809, Mr. Brown, of Musselburgh, published his opinion that the prophylactic virtue of cow-pox diminished as the distance from the period of vaccination increased, but his statements made no impression on the public mind. In 1818 and 1819, an epidemic small-pox pervaded Scotland, and many persons passed through a mild form of the disease. The term *modified small-pox* was now introduced, and generally adopted. Dr. MONRO, in 1818, published a volume on the subject (*Observations on the different kinds of Small-pox, and especially on that which sometimes follows Vaccination*), which attracted great attention. The more elaborate work of Dr. THOMSON, of Edinburgh, (*An Account of the Varioloid Epidemic,*) which appeared in 1820, occasioned much discussion among medical men, but their confidence in vaccination was in no degree shaken. In 1824, small-pox prevailed epidemically in Sweden, and attacked a considerable number of vaccinated persons. In 1825, an epidemic assailed London, where the bills of mortality announced 1300 deaths by small-pox, among whom were several persons who believed that they had been vaccinated. Similar epidemics subsequently pervaded France (1826 and 1827) and the northern parts of Italy (1829). In the same year, the government of Germany, who had always encouraged and even enforced vaccination, took alarm; and then began the practice of revaccination, which has formed so striking a feature in the medical history of those countries for the last ten years. Within the last two years, the same practice has been adopted voluntarily by vast numbers of persons both in France and England.

In 1833–4, small-pox prevailed epidemically at Ceylon, (*Report on Small-pox, as it appeared in Ceylon in* 1833–4,) when a considerable number of the vaccinated died; and on several occasions, both prior and subsequent to this date, it made great devastations in Hindostan, and the vaccinated have not been exempt from the calamity.

In 1838, small-pox again raged epidemically in London; the

admissions into the Small-pox Hospital in that year more than doubled the average number received annually prior to the discovery of vaccination. Two-fifths of the admissions consisted of persons who had been vaccinated. Many had the disease severely, and more than twenty of the number died. In the same year, also, small-pox prevailed extensively in the British army.

These historical details cannot be read without the conviction that all idea of banishing small-pox from the earth is vain and illusory.

II. PHENOMENA.

The regular course of cow-pox is as follows. On the third day from the insertion of the virus, the wound appears red and elevated. By aid of the microscope, the efflorescence surrounding the inflamed point will be distinctly perceived even on the second day. On the fifth day, the cuticle is elevated into a pearl-coloured vesicle, containing a thin and perfectly transparent fluid in minute quantity. The shape of the vesicle is circular or oval, according to the mode of making the incision. On the eighth day, the vesicle is in its greatest perfection, its margin turgid and sensibly elevated above the surrounding skin. In colour, the vesicle may be yellowish or pearly. The quantity of fluid which it contains varies much. When closely examined, the vesicle exhibits a cellular structure. The cells are from ten to fourteen in number, by the floor of which the specific matter of the disease is secreted. The vesicle possesses the umbilicated form belonging to variola.

On the evening of the eighth day (after the incision), an inflammatory circle, or areola, commences at the base of the vesicle. The skin becomes tense, red and painful for a considerable extent around. The figure of the areola is perfectly circular. In some cases, the subjacent cellular membrane participates in the inflammatory action, and occasionally the glands of the neck swell. The areola continues to advance during the ninth and tenth days. On the eleventh, it begins to fade, leaving, in its decline, two or three concentric circles of a bluish tinge. The vesicle has by this time either burst, or been opened by the lancet, and a scab forms of a circular shape, and of a brown or mahogany colour. By degrees this hardens and blackens; and, at length, between the eighteenth and twenty-first day, drops off, leaving behind it a cicatrix of a form and size proportioned to the prior inflammation. A perfect vaccine scar should be of small size, circular, and marked with radiations and indentations.

Until the eighth day, the constitution seldom sympathizes. At that time, however, slight febrile excitement generally comes on. There is, however, much variety observable here. Sometimes scarcely any constitutional disturbance is perceptible. It is not un-

common to find the child's body covered generally or partially with a papular eruption of a lichenous character, from the ninth to the twelfth day, or even later. It is seldom seen in adult vaccination; but is frequent in children of full habits, in whom numerous vesicles had been raised, which discharge freely. The irregularities and anomalies of cow-pox are various. That most commonly observed, is when the vesicle, at a very early period, becomes prematurely red and itching; a small acuminated, conoidal pustule is perceived on the eighth day, surrounded by a slight areola of irregular shape. The contained fluid, instead of being a clear and transparent lymph is opaque, and of a light straw colour. The succeeding scab is small, and drops off prematurely.

In another variety, the specific inflammation proves very violent. It extends from shoulder to elbow, and sometimes runs into genuine erysipelas. The vesicle, instead of drying into a hard scab, is converted into an ulcer, discharging profusely, and leaving behind it a large scar of the size of a common wafer, in which neither rays nor depression can be traced. The question, how far such severe local irritation interferes with the constitutional result of cow-pox, has never been satisfactorily determined.

A third variety exhibits, about the sixth or seventh day, the vesicle partially inflamed and scaly. A species of psoriasis takes place of variola. No confidence can be placed in so defective a process as this.

Cow-pox is occasionally retarded in its progress without any obvious cause. We have never known the period of retardation to exceed sixteen days.

The proper time at which lymph may be taken, so as to obtain it in the most efficient state for propagating the disease, has been a subject of much discussion. The facts bearing on this question are, we believe, as follows: The younger the lymph is, the greater is its intensity. The lymph of a fifth-day vesicle, when it can be obtained, never fails. It is, however, extremely powerful up to the eighth day, at which time it is also most abundant. After the formation of the aroela, the true specific matter of cow-pox becomes mixed with variable portions of serum, the result of common inflammation, and this diluted lymph is always less efficacious than the concentrated virus. After the tenth day, the lymph becomes mucilaginous and scarcely fluid, in which state it is not at all to be depended on. Out of a dozen incisions made with such viscid lymph, not more than one will prove effective.

Infantile lymph is more to be depended upon, than that obtained from adults. The matter of primary is more energetic than that of secondary vaccinations. These statements may serve as a guide to the surgeon in the important matter of selecting lymph with which the operation is to be performed.

Another matter worthy of consideration is the mode of making the incisions, so as to insure the best and most certain results.

We know that, provided the lymph be good, it matters little in what way the virus be applied, but we have reason to believe that the following is the most uniformly successful mode. Let the lancet be exceedingly sharp. It should penetrate the chorion to a considerable depth. In making the incision, the skin should be held perfectly tense between the forefinger and thumb of the left hand. The lancet should be held in a slanting position, and the incision made from above downwards. We would recommend, that with lymph of ordinary intensity three or four vesicles should be raised, and that these should be at such distances from each other as not to become confluent in their advance to maturation.

Vaccine lymph should always be used in a fluid state, and direct from the arm, whenever practicable; for it is a very delicate secretion, and the smallest fermentative process in it is liable to alter its qualities, and to occasion that irritable sore, which we have named as the most frequent of the anomalous appearances.

III. THEORY.

It would lead us into too wide a field to follow out the views which have at different times been taken regarding the modus operandi of vaccination. Jenner originally proposed and steadily adhered to the notion, that cow-pox and small-pox were identical in their nature, and that vaccination is only a milder form of inoculated small-pox. This opinion has received a very remarkable corroboration in the recent experiments of Mr. Ceely of Aylesbury, which have proved that the cow may be inoculated with variolous matter, and that, in passing through the body of the animal, the matter is converted from small-pox into vaccine. But though it be admitted that cow-pox and small-pox have a common origin, it by no means follows that they are identical diseases, acknowledging the same laws. The immediate effects of the two poisons undoubtedly differ. The local inflammation is different, and the constitutional influence is different. It would be unfair therefore to argue regarding their ulterior effects without reference to the results of experience. Now it is impossible to call in question the fact that vaccinated persons are more liable to attacks of small-pox than those who have once undergone that disease. The one is now very common. The other was always considered as a rare event.

Among the circumstances that materially influence the protecting power of cow-pox is time. In the early periods of vaccination (1800 to 1805), the practice of inoculating after cow-pox, so as to test its prophylactic power, was carried to a great extent, and many thousands were exposed to the variolous effluvium with impunity. Since the year 1808, these experimental testings have almost entirely ceased, and we consequently know very little concerning the effect

of inoculation at long intervals from the date of vaccination. But it is a matter of general notoriety, that small-pox, taken casually after vaccination, is very rare under the age of eight years. The protective power may be considered as nearly complete for that period. About the ninth or tenth year of life, small-pox after vaccination begins to be met with. It increases in frequency at the period of puberty, and is still more common between the ages of 18 and 25. With these facts before us, it is impossible to conceal the apparent conclusion that time lessens the power of resistance to the variolous germ.

The influence exerted by an atmospheric constitution over the power of variolous resistance, opens a wide but hitherto neglected field of inquiry. Having now witnessed in London two severe epidemic visitations of small-pox, we have no hesitation in stating that such influence is undoubted. The fact does not, from its very nature, admit of direct proof, but the number of persons attacked during epidemic seasons, who had successfully resisted small-pox contagion *communibus annis*, offers an argument in favour of the position, which to our minds is irresistible.

We come now to apply these views of vaccine pathology to the examination of the two practical measures suggested of late years to remedy the acknowledged defects of vaccine influence. The first of these is recurrence to the cow for supplies of primary lymph. The second is revaccination at distant intervals from the date of the primary process.

1. Recurrence to the cow for primary lymph.—The impression that vaccine virus decays in power in proportion to the number of times that it makes the circuit of the human body, has long prevailed, and is steadily gaining ground. In all parts of the Continent, and in England, it has led to the frequent trials of lymph recently obtained from the cow.

Persons vaccinated by Dr. Jenner himself, in the very infancy of the practice, before such deterioration could possibly have taken place, have undergone small-pox in after life. Such occurrences are now more common than formerly, but much may be attributed to the extension of the practice of vaccination. The Royal Jennerian Institution of London employs now the same lymph which has been in use since the year 1806, when the Institution was founded. According to this authority, lymph recently obtained from the cow does not generate a vesicle in any way superior to that produced by the old lymph. (*Report of the Royal Jennerian Institution*, 1836.) The same result was obtained in Italy, in 1829, when the alarm of epidemic small-pox induced the Piedmontese physicians to try a variety of new stocks of lymph. We are informed by Dr. Griva, (*Epidemia Vainoloso del Torino*, 1829,) chief of the Vaccine Establishment at Turin, "that no perceptible difference was to be traced between the aspect and progress

of the old and the new, the primitive and the long humanized virus." In Germany the plan of recurrence to the cow has been largely tried of late years. In Wirtemberg alone, between 1831 and 1836, forty varieties of primitive lymph were successfully employed. The notion of superior efficacy attaching to the new lymph was, however, not generally entertained. (Heim, *Historische Kritische Darstellung der Pockenseuchen.*) On the other hand, we are bound to acknowledge that the Small-pox Hospital of London changed their old stock of lymph for more recent matter in 1837, and that a marked improvement was perceived in the resulting vesicles. The local inflammation was more severe, the constitutional symptoms were more violent; the virus was more energetic; the most minute incision took effect, and the lymph given out on the ninth and tenth day was still in an active state. The National Vaccine Establishment has also, on several occasions, varied their stock of lymph with advantage. In France, a new variety of vaccine lymph, obtained from the dairies of Passy, near Paris, and called *Passy* lymph, was brought into use in 1836, and is considered by many as superior to the old stock. In 1838, Mr. Estlin of Bristol opened a new source of lymph from a dairy in that neighbourhood. It has been found very energetic, and is now employed in many parts of England in preference to the lymph of the National Vaccine Establishment. [With regard to the more certain and permanent protective power of vaccine matter, taken directly from the cow, over that which has been transmitted more or less frequently through the human system, the committee on vaccination, in a recent report (Feb. 1845) made to the Academy of Sciences, observe: "The greater intensity of new vaccine matter, as compared with that long in use, is a fact definitely established by experience in England, Germany, Italy, and France. But is this greater intensity coupled with a greater preservative power? or, as the report puts the question—Is there any relation between the lesser or greater intensity of the local phenomena and the protective power of the variolous matter? The experiments made on this point show that the protective power of vaccine matter is not proportioned to the intensity of the local symptoms, but that vaccination, with matter taken from the cow, is more certain than old vaccine matter. Admitting that the protective power of vaccine matter diminishes with time, should it be renewed, and if so, how? Has the greater or lesser intensity of the local phenomena of vaccination any relation of its preservative power? The diminution of power, according to the report, is undoubted.

As to the means of renewal, the first mode employed was the transmission of vaccine matter from man to the cow—an experiment frequently performed as a matter of curiosity, but only recently sought to be rendered a means of restoring to the vaccine matter its pristine lost energy. The authors of several of the memoirs maintain that the cow, when thus vaccinated, restores the

vaccine matter unaltered, and therefore unregenerated, but the commission of the Academy think this conclusion too absolute : in fact, it has been established by the experiments of the author of one of the memoirs, that vaccine matter taken from man is regenerated during its transmission through the cow. The same fact results from thousands of experiments made in Bavaria under the direction of government. Vaccine matter thus regenerated, failed in less that 1 case per 100, while the failures of the old vaccine matter were nearly 3 per cent. Would it not be better to transmit the vaccine matter through several cows in succession than through one only? The mode, however, which should be preferred to all others—the only one on which we can entirely rely—is, as recommended by JENNER, to obtain vaccine matter from its original source. Several circumstances seem to show that the cow-pox is perhaps of less frequent occurrence than is commonly thought, and the commissioners suggest that those who happen to meet with it, should not content themselves, as has been hitherto done, with transmitting it to man, but should transmit it to other cows, and thus regenerate the infection.

The results are 1st. Vaccine matter taken directly from the cow causes local symptoms of greater intensity; its effects are also more certain than those of old vaccine matter, but after being transmitted for a few weeks through the human subject, the local intensity disappears.

2d. The preservative power of vaccine matter does not seem to be intimately connected with the intensity of the symptoms of vaccination; nevertheless it is prudent to regenerate vaccine matter as frequently as possible, to preserve its protective power.

3d. The only mode of regenerating vaccine matter deserving of confidence is to procure it from the cow."

In 1838, Professor DUNGLISON obtained from Mr. ESTLIN, of Bristol, vaccine matter eleven removes from the cow. Dr. KIRKBRIDE, after an extensive trial, observes that his own observations induced him to put more confidence in its prophylactic powers than in that of the old virus.]

2. REVACCINATION.—By many of the physicians of Germany, this measure is extolled as scarcely less important in its effects, nor less widely applicable, than vaccination itself. The authorities in Paris, on the other hand, have reported to the French government against the necessity of revaccination, and there is really some difficulty in deciding on the actual merits of the plan. The Germans aver that few, if any, of the recently revaccinated have fallen under the influence of small-pox, but the time which has elapsed since the general adoption of the measure detracts from the value of such a statement. The practice may be recommended for its safety, even if it be much less serviceable than the Germans contend for. We have sufficient facts before us to state with confidence that it

need never be recommended prior to the tenth year of life, and that the age best fitted for it is from the period of puberty to that of confirmed manhood.

[The question of the propriety of revaccination has become one of great interest. Without entering here into any discussion of its merits, it will be our object to state briefly, the evidence which has led to a general belief of its necessity. The most complete investigation of this important subject has been undertaken within the last six years, by committees appointed by the French Academy of Sciences. In 1840, the following question was proposed by that body:—"Is the preservative power of vaccination absolute, or merely temporary? If it is temporary only, determine by accurate experiments, and authentic facts, what is the period for which the vaccine matter exerts its protective influence against small-pox." The result of this inquiry is in substance as follows:—An attentive examination of what occurred during thirty epidemics of small-pox in France shows two important facts—First, that somewhat more than one-third of the entire number of persons attacked with the small-pox had been vaccinated; secondly, that the mortality among the vaccinated persons was very small. According to the author of one of the memoirs, more than one-third of those attacked in the epidemics which occurred at Montbeillard had been vaccinated, but there was no corresponding increase in the amount of mortality amongst the vaccinated patients; and the same result was observed in the epidemic of 1828 at Marseilles. The same results follow from an examination of the epidemics that have occurred in England, Sweden, Denmark, Italy, Malta, Geneva, &c.

The fact, then, being established, that vaccinated persons can become affected with small-pox, and the proportion so attacked during epidemics being nearly determined, a most important problem remained to be solved—viz., what was the condition of the vaccinated persons affected as regarded the mere fact of their vaccination? The authors of all the memoirs agree in stating that vaccinated persons were not affected indiscriminately, or by chance, as it were; on the contrary, the small-pox seems to make a kind of selection from amongst them. With some exceptions, the small-pox attacks those who have been vaccinated since a long period, and spares those who are recently so. An examination of the tables published in various parts of Europe, proves positively that children are seldom attacked with small-pox before the ninth year of vaccination, and also proves the converse fact, that it attacks in preference persons who had been vaccinated ten, fifteen, twenty, thirty, or even thirty-five years previously.

A general fact, which might be anticipated from the history of eruptive complaints is, that after the age of thirty-five years, the aptitude of vaccinated persons to contract small-pox becomes so slight that it may be considered as having vanished. An investi-

gation of the facts relative to the occurrence of small-pox in vaccinated persons, lead to the three following conclusions:—

1st. The protective power of vaccination is absolute and general for the first five or six years, and even to the eleventh or twelfth year, to judge from the experiments on revaccination.

2d. After the foregoing period, a part, but a part only, of those vaccinated, again become liable, especially under the influence of an epidemic, to contract small-pox.

3d. The greater number of those vaccinated probably remain completely protected from small-pox during their entire life.

Is it necessary to vaccinate the same person several times? and if so, after the lapse of how many years should the revaccination be performed? On this head the report first refers to the fact that the revaccinations, performed for a considerable period after the discovery of vaccination, did not succeed, except in some rare cases, because they were performed too soon after the primary vaccination. But when at a later period experience showed that the protective power of vaccination diminished with time, the practice of revaccination was resumed, and then succeeded beyond expectation. In some parts of Germany, especially, revaccination was practised universally in the army, and even in civil life. Physicians also who had had small-pox in some instances revaccinated themselves, with success, of which Dr. Heim is a remarkable example. He attended on his brother for three weeks while he laboured under confluent small-pox, and three weeks after having gone through this decisive trial, he vaccinated himself, and had pustules almost of the ordinary size. Dr. Moreau, the celebrated accoucheur, who had small-pox in early life, revaccinated himself three times with success.

A document, published by the government of Wurtemberg, which showed that of 1677 persons affected between 1831 and 1836 with small-pox, 1055 had been vaccinated, contributed greatly to extend the practice of revaccination in Germany and in the north of Europe. In France, the statistics of epidemic small-pox show that the number of vaccinated persons attacked with small-pox constitute more than a third of the whole number of patients affected. It is impossible, therefore, to doubt the propriety of practising revaccination. It is during epidemic small-pox especially, that the utility of revaccination becomes obvious. Not only have individuals been thus protected, but the spread of the epidemic has been arrested.

In Prussia revaccination has been practised in the army, since 1833, and the small-pox has been almost entirely extirpated. In Wurtemberg but one case of variola occurred in five years among 14,384 revaccinated soldiers, and 3 only among 29,864 revaccinated civilians. Epidemic small-pox has not appeared in France since 1830, the period when revaccination was commenced. The authors of the memoirs agree that during epidemics it is prudent to revaccinate

about the eighth or ninth year. The answers given by the competitors for the prize to the questions proposed by the Academy, may be thus summed up :—

1st. The preservative power of vaccination is absolute for the majority, and temporary for a small number; and even in the latter it is absolute until adolescence.

2d. Small-pox rarely attacks those who have been vaccinated before the age of ten or twelve, from which age, until thirty or thirty-five, they are particularly liable to small-pox.

3d. In addition to its protective power, vaccination so modifies the animal economy that it attenuates the symptoms of small-pox, abridges its duration, and considerably diminishes its danger.

4th. Revaccination is the only known method of distinguishing those vaccinated persons that remain protected from those that do not.

5th. The success of revaccination is not a certain proof that the person in whom it succeeds was liable to contract small-pox; it merely establishes a tolerably strong presumption that they were more or less liable to be so.

6th. In ordinary periods revaccination should be practised after fourteen years, but sooner during an epidemic.

Professor Chomel, of Paris, a warm advocate of revaccination, has expressed the opinion in his lectures, that we should not hesitate to recur to it as a measure of the greatest utility, and that it will not be long before the authorities are convinced of the necessity of making it compulsory, as a general sanatary measure. Professor Chapman holds this language : "Now from these data it is probable, perhaps certain, that by this time the system regains, in many instances, at least, its sensibility to the vaccine infection, and it may be presumed, in the same way, to that of small-pox. The lesson is hence inculcated, to test it in all cases by revaccination. No apology, indeed, can be made for the omission. To do it is our bounden duty, and any neglect on our parts may be deemed a flagrant misdemeanour, for which we must be held responsible."*

One of the chief grounds on which the utility of revaccination has been combated, is, that the propriety of the measure once recognized, public confidence in the preservative power of vaccine would be diminished or destroyed. The futility of this idea is ably shown by Dr. Chomel, in an extract from one of his clinical lectures delivered at the Hôtel-Dieu, during the session 1842–43.

"Certainly, if it were proved that a second vaccination was a useless and insufficient preservative against an attack of secondary small-pox, there would be some reason in abstaining from spreading among the people ideas which could disturb their confidence; but innumerable facts depose against this conclusion. It is false, too, that revaccination condemns primitive vaccination; it only

* [Lectures on the more important Eruptive Fevers, &c., p. 106.]

proves that this has not an absolute and unlimited efficacy, that its preservative powers become enfeebled in time, and that they must be renewed by a new vaccination. Besides, let us suppose that this false opinion reigned among the people, ought physicians to suffer themselves to be guided by an erroneous public notion, and not by their own conviction? What inconvenience is there in a vaccinated person undergoing the operation a second time? None! It occasions even no interruption to the daily habits of the person. If, after several days, the vaccine pustules are not developed, you have the satisfaction of knowing that the individual is for some years safe from any attack of variola. If, on the contrary, the vaccine succeeds, we must conclude that an attack of small-pox might sooner or later have occurred, and that by this precaution the individual will for the future be preserved from it. Let us suppose now that an individual predisposed to secondary small-pox will not be revaccinated, and that he is attacked with the disease, how very different is the position of this person with one who has submitted to revaccination. One by taking an insignificant precaution will suffer from no inconvenience, whilst the other, supposing that he has only simple discrete variola, will be obliged to remain in bed for some days, and if it should be confluent, what danger will be not run? In regard, then, to this, there can be no doubt; the inconveniences on one side, and the advantages on the other, are too evident. There is, besides, a reason of morality and public interest which is strongly in favour of my opinion. A person who is revaccinated, not only preserves himself against an attack of small-pox, but the security will extend to those who might have been exposed to the contagion, had that individual, instead of being revaccinated, had an attack of small-pox. This is an argument, I conceive, of great weight in favour of revaccination. Besides, by this means we may rationally anticipate sooner or later to destroy variola altogether. This consummation will indeed be consoling, and worthy in every way of our art."]

CHAPTER XI.

MEASLES.

[Syn.—*Rubeola, Morbilli, Febris morbillosa; Rougéole, Fièvre Morbilleuse*, Fr.; *Masern, Masernkrankheit, Kleine Pest*, Germ.]

The terms, *The Measles*, (Cullen,) *Rubeola*, (Willan, Sauvages,) *Morbilli*, (Sydenham, Morton,) are employed in the present day as synonymes to designate a disease, the distinguishing characters of which are, a continued contagious fever, accompanied by a peculiar exanthema or rash, generally combined with inflammation of the mucous membrane of the respiratory organs.

The earliest writers on measles have created no little confusion by describing the small-pox and measles as the same disease, admitting, in their judgment, of some variation in its forms. Rhazes himself, in a tract published in the ninth century, (*De Variolis et Morbilli*, A. D. 1486, transl.,) considers the measles and small-pox as the same disease, requiring a similar mode of treatment; but he was more careful than any of his countrymen to point out some of their specific differences. However extraordinary it may appear, this error was transmitted by medical authors through eight or nine centuries. The sagacious Sydenham distinguished and described great differences between the two diseases, as may be seen in his account of the *Variolæ regulares*, A. D. 1667–8, and of the *Morbilli*, A. D. 1670. Nevertheless, Sydenham adverts to the analogies which had caused physicians to confound these diseases, and particularly to the decline of the measles on the eighth day, "Quo tempore vulgus (a spatio, quo perdurare solent variolæ) deceptum, eosdem introverti adfirmat; licet reverâ morbilli cursum à naturâ destinatum absolverint." (*Op. Univ.*, sect. iv. cap. 5.)

In the history of scarlatina it has been shown how long that disease was mistaken for a severer form of measles, and that Morton with many subsequent writers, even so recently as the end of last century, contended that they differed only in degree and not in kind. It was not until the appearance of Dr. Withering's *Essay on Scarlet Fever*, in 1793, and Dr. Willan's *Treatise on Cutaneous Diseases*, that the profession at large was convinced of the distinct nature of the two diseases. The observations of these, as well as subsequent writers, have satisfactorily shown that, in the precursory symptoms, in the characters of the rash, in the accompanying lesions of internal organs, and in the sequelæ, there are solid reasons for believing these two diseases to be induced by separate specific poi-

sons. Frank, in his *Observations upon the Exanthemata*, (vol. ii. p. 216, French edit.,) has remarked that, as "there is no exanthema which does not occasionally exist without its peculiar fever, so, on the other hand, there is not one of the exanthematous fevers which does not, in certain cases, pursue its course without any cutaneous eruption, and with the same consequences as in other cases." The accuracy of this remark is more apparent in the history of scarlatina than of rubeola; nevertheless, the irregularities in the symptoms of the latter disease manifested in different individuals, and in distinct epidemics, are sufficiently striking to warrant us in describing three forms or varieties of rubeola.

We shall first describe the more ordinary form of measles (*Rubeola vulgaris*); secondly, that in which the action of the poison, as in one of the varieties of scarlatina, is limited to the skin (*Rubeola sine catarrho*); and, thirdly, that form in which the intensity of the poison is manifested by the most malignant symptoms (*Rubeola maligna*).

A. RUBEOLA VULGARIS.

In this form there are symptoms of febrile disturbance, generally for several days before the appearance of the characteristic rash In the slighter cases the premonitory symptoms are those of catarrh, accompanied with profuse watery discharges from the eyes and nose: in the more severe cases, on the first and second days, there are irregular shiverings alternating with heat of skin, general lassitude or listlessness, occasional flushing, giddiness, sensation of pain or weight across the forehead, with drowsiness, soreness of the throat and hoarseness, thirst, furred tongue, frequent pulse, and in some cases epigastric tenderness with sickness or vomiting. On the third and fourth days these symptoms become aggravated, the eyes smart, the conjunctiva becomes suffused, the eyelids swollen, and the tarsi red, with copious secretion of watery fluid from the eyes and nostrils, frequent sneezing, harsh dry cough, and oppression of breathing. It is during this accession of symptoms that the efflorescence makes its appearance. In those who have a delicate florid skin, or who are living in a high temperature, the rash sometimes appears partially on the third day; but when the skin is dark or thick, or when the patient is exposed to cold, it may not come out till the fifth or sixth day; in general, however, it appears on the fourth day. It is first visible on the head, around the margin of the hairy scalp, behind the ears and about the temples, then, on the forehead, nose, cheeks, and throat, exhibiting elsewhere, in the course of the first day, only a few scattered red specks like flea-bites. The rash consists of small irregular red dots, slightly prominent and sensible to the touch, especially on the face, of a less bright tint than that of scarlatina; sometimes, however, as in the malignant measles, the colour is dark and livid; to those cases Willan applied the term *Rubeola*

nigra. The colour of the skin vanishes on pressure, but rapidly returns when that is removed. The rash in some cases is so abundant, that but little of the skin is left in its natural state; the red spots become confluent, and form patches, which frequently assume a semilunar or crescentic shape. These patches are slightly raised, and give to the finger the sensation of an uneven surface. In the severer cases, and especially in infants, the rash is often interspersed with papulæ, and during the height of the efflorescence, vesicles sometimes appear on the neck, breast, and arms. In many cases, at the height of the eruption, there is swelling of the face, and especially of the eyelids, which are sometimes so swollen as to close the eyes for a day or two. The eruption does not at once cover the whole body, but having appeared, on the third or fourth day of the febrile attack, on the head, face, neck, and slightly on the upper extremities, on the fifth day spreads over the trunk and upper extremities, and on the following day becomes visible on the lower extremities. At this period the efflorescence is said to be at its height. On the succeeding three days the rash gradually fades and disappears, first on the face, then on the trunk and upper extremities, and lastly from the lower extremities. When the rash begins to decline on any part, the cuticle becomes dry and rough, and soon after separates in the form of scurf. Hence arises a troublesome itching of the skin, which continues from the seventh to the tenth day. It is to be observed that, with the appearance of the rash on the surface of the body, small dark red patches, more or less confluent and of nearly similar form, may be detected on the palate, uvula, and tonsils. This state of the fauces occasions a sensation of soreness in the throat, but is not followed by any lesion of the part, and disappears as the rash declines from the surface of the body.

The inflammation of the eyes, the discharge of tears, the sneezing and hoarseness, generally cease on the decline of the efflorescence about the seventh day; at least the swelling of the eyelids and watery secretion are much abated at that time. The febrile symptoms do not sensibly diminish on the appearance of the rash, but are often somewhat aggravated; the more distressing symptoms, however, generally abate on the sixth day. About the ninth or tenth day, or even at an earlier period, especially in children, diarrhœa often supervenes, and is troublesome for days afterwards. Between the fourth and sixth days, epistaxis, or, in adult females, uterine hemorrhage, sometimes appears. In many instances upon the decline of the eruption, the pectoral affection becomes predominant, and often places the patient in danger. This is indicated by the increased frequency of cough, hurried breathing, and aggravation of the febrile symptoms. Upon careful auscultation, the existence of diffused bronchitis, and occasionally the physical signs of circumscribed pneumonia, or pleuritis, may be detected; these affections are often prolonged for several weeks beyond the ordinary duration

of the disease. More rarely, the decline of the rash in children is succeeded by acute inflammation of the larynx or treachea.

Such is the usual course of the measles in their more common and regular form, but some peculiarities are occasionally observed, which require to be noticed. Thus the eruption, sometimes anticipating the ordinary time of its appearance, comes out on the second day; in other instances the catarrhal symptoms exist for a fortnight or longer before the appearance of the rash. In some instances the rash appears first on the body instead of the face, and in some rare cases it has been confined to those parts without spreading to the extremities. Again, it has occasionally been observed, that the rash, after having declined, has reappeared with symptoms of fever. Dr. Willan, in his *Reports*, p. 106, has related two remarkable cases of this anomaly; and Dr. Conolly has recorded a nearly similar case, where the eruption came out and seemed to be disappearing at the usual period, when it suddenly broke out again, and to such an excessive degree, as to make it impossible to recognize the features. (*Cyc. Pract. Med.*, art. Hysteria.) Frank has also detailed a case of the same irregularity (tom. ii. p. 377). Some other irregularities in the course of measles have been occasionally noticed. Thus Dr. Heberden met with a case where salivation appeared to be vicarious of the catarrhal symptoms. Sometimes, also, muscular twitchings, or even convulsions, precede the eruption.

B. RUBEOLA SINE CATARRHO.

When the measles are epidemic, a few cases occur in which the eruption goes through its different stages without the usual catarrhal, and with very slight febrile symptoms. This variety, first observed by Willan, does not protect the constitution from the regular form of measles; and on this account it is rejected by Frank as spurious: and Dr. Williams (*Elements of Med.*) says, that "this reason would certainly be sufficient to induce him to acquiesce in this decision." But this objection cannot be admitted, for, besides the opinion of Willan, Bateman, and other writers, that it is a distinct variety, the recurrence of measles in the same person has been witnessed by Willan, Baillie, and others.

C. RUBEOLA MALIGNA.

A more severe form of measles has been noticed to prevail occasionally, to which the term *malignant*, or *putrid*, has been applied. During ordinary epidemics, a few cases of this malignant type may occur; but it has been observed sometimes to constitute the prevailing character of the disease. The eruptive fever and catarrhal symptoms are from the beginning severe, the former soon assuming the typhoid aspect, while, through the whole course of the disease,

insidious local inflammations, especially of the lungs, arise, and which either speedily destroy the patient, or protract the course of the disease indefinitely.

At the commencement there is nothing remarkable, except that the fever is violent; there are extreme restlessness, thirst, and heat of skin; the pulse is frequent, but soft and compressible; the respiration hurried: the cough, dyspnœa, sense of tightness, or præcordial oppression, distressing; the eruption comes out irregularly, appearing sometimes earlier than usual, receding and reappearing. It is seen in irregular patches on different parts of the body, at one time red, at another pale, livid, or interspersed with petechiæ or ecchymosis. The mucous membrane of the tongue and fauces assumes a dusky red or livid colour; there is often sickness or vomiting, with abdominal tenderness and frequent dark offensive stools. The brain partakes early of the constitutional distress; the look is oppressed, and transient delirium passes into coma, or convulsion supervenes. In the majority of cases, inflammation either in the lungs or brain arises, and does not abate with the decline of the eruption, while the fever assumes more and more the typhoid type, the pulse becoming very frequent. Many patients sink rapidly, asphyxiated by the intense congestion of the pulmonary mucous membrane; in others, subsultus and convulsions supervene, and speedily destroy the patient: not unfrequently, however, life is protracted a considerable time, the powers being gradually exhausted by diarrhœa and discharges of the mucous membranes.

This form of disease is fortunately of rare occurrence, though now and then, as has been stated, isolated cases may occur in an epidemic otherwise mild. Huxham has described an epidemic of malignant measles occurring at Plymouth, A. D. 1745. (*De Morb. Epidem.*, vol. ii.) Sir William Watson, who was physician to the Foundling Hospital, describes epidemics of malignant measles which attacked the children of that institution in the years 1763 and 1768. In the former 183 were attacked, and 19 died; in the latter 139 had the disease, and 6 only died. (*Med. Obs.*, vol. iv.) In 1816 a malignant form of measles appeared in Edinburgh, and many children died from pulmonary inflammation, the pulse having been very rapid, and the eruption irregular, and of a livid colour. Similar epidemics have been also occasionally observed in other countries. In the autumn of last year (1839) we were called upon to assist the medical officers in Christ's Hospital in controlling epidemic malignant measles, which appeared among the boys at Hertford. The symptoms closely resembled those described by Huxham and Watson: of 127 boys attacked seven died of pulmonary inflammation, which resisted the ordinary treatment.

[II. COMPLICATIONS.

Of all the complications of measles broncho-pneumonia is the most common. In 167 cases MM. Rilliet and Barthez observed 24 cases of bronchitis, 7 of pneumonia without bronchitis, and 58 of lobular broncho-pneumonia. No special character is presented in the bronchitis of measles, and dilatation of the bronchi was never met with by MM. Rilliet and Barthez, unless the child had lived at least ten days after the occurrence of the pneumonia. The pneumonia is almost always lobular, involving both lungs to a greater or less extent—so that kernels of inflamed lung are found, either isolated or united, in every lobe—the posterior and inferior portions being those chiefly affected. The same authorities state that, compared with pneumonia occurring under other circumstances, the formation of abscesses is very common in that of measles, nearly one-half the autopsies exhibiting these, and sometimes in large numbers. Broncho-pneumonia may arise at three periods of the disease.—1. During the stage of incubation, and the first period of the eruption; 2. During the decline of the eruption; and 3. During convalescence. It is met with more frequently during the first of these periods than during the other two put together. When pneumonia supervenes during convalescence, it may be independent of the disease, and in such cases is lobar; but generally there is a direct connection, and it is then lobular. Sometimes the pneumonia becomes very chronic, giving rise to the suspicion of pulmonary tubercles, but on examination after death abscess of the lungs is found. Pneumonia is most common in young children, whilst bronchitis is met with in those who are older. Rilliet and Barthez state that gangrene of the lungs is not an infrequent complication. Another common complication is inflammation of the larynx and pharynx, occurring usually about the fourth or fifth day of the eruption. Of the 167 cases before alluded to, in 24 there was pharyngitis, in 19 laryngitis, and in 16 laryngo-pharyngitis. Rilliet and Barthez regard laryngitis as a more special complication of measles than pharyngitis, and believe the frequency of the latter due to the simultaneous presence of scarlet fever epidemics. In a severe epidemic of measles which occurred in South Dublin Union Workhouse in 1844, Dr. Battersby states that a diphtheritic inflammation of the mouth, fauces, and larynx was the principal complication.*

Gastro-intestinal lesions are next in frequency to pulmonary.

Measles may become complicated with other exanthemata. MM. Rilliet and Barthez have seen small-pox twelve times, scarlatina seven times, and erysipelas three times in conjunction with them. Under these circumstances the diagnosis is often embarrass-

* [Dublin Journal, Sept., 1845.]

ing. What is more remarkable in such cases is, that the intensity of the complication is the inverse of that of the special eruption. Thus, when the scarlatina predominates, the bronchitis is most severe; but when the rubeola prevails, the angina is most intense. This may be explained by the mutual compensatory functions of the skin and mucous membranes, and when the former is completely invaded by the scarlatinal eruption, causing the retrocession of the measles, the pulmonary affection is augmented.]

III. SEQUELÆ.

Measles are frequently followed by troublesome affections of the mucous membrane of the lungs or intestines. The occasional supervention of inflammation of some of the tissues of the lungs in the course of rubeola vulgaris has already been noticed. Upon the decline of the disease, chronic bronchitis, pertussis, or tubercular disease of the lungs, occasionally supervenes. [MM. Rilliet and Barthez have shown that measles is the origin of tuberculization in a considerable number of cases. They express their belief that rubeola hastens the development of tubercles, and accelerates the progress of those already deposited. Dr. Bouchet expresses very strongly the opinion that measles have great power in the development of pulmonary tubercles, and accelerates the progress of phthisis in children who already are its subjects.] The cervical and mesenteric absorbent glands frequently enlarge, and occasion great constitutional irritation. Another sequela of measles is a troublesome diarrhœa, which greatly exhausts the patient. Ophthalmia and abscesses in the ear, and in the cellular tissue surrounding the parotids, also occasionally supervene. Sometimes aphthæ appear on the tongue and lining of the mouth, which quickly degenerate into formidable gangrenous ulceration; and in some rare cases similar ulceration appears about the pudenda. [Cancrum oris is a very frequent sequela of measles; Dr. Gregory says it is "much more common after measles than after any other exanthematic malady."* In two extensive epidemics of measles which we have observed within the last ten years in the Children's Asylum attached to the Philadelphia Hospital, cancrum oris occurred to a great extent after both. But it must be borne in mind that these children are generally miserably cachectic, and in many instances suffering from organic diseases. In an epidemic which the writer witnessed at St. Joseph's Orphan Asylum, in this city, in 1845, where there are about one hundred children, nearly all of whom are of good constitution, no sequelæ of consequence followed in a single case.] Various forms of cutaneous affections, more especially pustular porrigo and impetigo, are also apt to appear after measles.

* [Lectures on the Eruptive Fevers. London, 1843, p. 110.]

[IV. STATE OF THE BLOOD.

Andral and Gavarret found that in measles the fibrin never exceeded, nor did it ever fall much below Lecanu's average. In most cases the corpuscles were above the normal standard. The following analyses are quoted from their researches:

Venesection.	Day of eruption.	Water.	Fibrin.	Blood corpuscles.	Residue of serum.
1st Case 1	3	760·2	2·6	146·6	90·6
2d " 1	2	766·9	3·0	140·9	89·2
3d " 1	3	781·6	2·6	137·1	78·7
4th " 1	2	786·7	2·5	137·5	73·4
4th " 2	–	795·8	2·7	131·6	70·1
5th " 1	2	792·1	2·4	118·6	86·9
5th " 2	–	823·2	3·4	93·3	80·1

The residue of the serum contained on an average 8·4% of inorganic constituents, which was one of the highest amounts that occurred in the course of their researches.

The patient in case 3 had also been bled on the first day of the eruption: the second bleeding in case 4 was performed on the second day after the disappearance of the eruption.

The young woman from whom the blood in case 5 was taken, presented so strongly the general appearances of anemia in consequence of excessive menstruation, that the amount of corpuscles, 118·6, may be regarded as very high: the second venesection was performed after the disappearance of the eruption, and when symptoms of tubercular phthisis were very apparent.*]

V. ANATOMICAL CHARACTERS.

It is very rarely that death occurs during the eruptive stage of measles, so that the condition of the mucous membrane of the trachea and bronchi at this early period is unknown, though it is probably more or less involved in the eruption. In unfavourable cases the fatal termination generally happens after the decline of the eruption, in consequence of some serious pulmonary lesion or protracted diarrhœa. Dr. Willan found, in some of his fatal cases, "an effusion of lymph mixed with blood, or matter, into the cavity of the thorax." Laennec was of opinion that the suffocating orthopnœa, which sometimes carries off children at the termination of measles, was produced by idiopathic œdema of the lungs. Dr. Williams says, that if the substance of the lungs becomes inflamed, the quantity of fluid effused into them is frequently so considerable, that it streams as from a sponge as soon as the lung is divided. Dr. Montgomery, on the other hand, asserts, that in the greater number of cases examined after death

* [Simon's Animal Chemistry, p. 245.]

by him, the morbid alteration existing was the condensation of the pulmonary structure ordinarily found as the effect of pneumonia. In the fatal cases recorded by M. Rayer, the most frequent morbid lesions discovered were extensive bronchitis, gastro-enteritis, pneumonia, pleuritis, croup, and enlargement of the mesenteric glands. (*Traité des Maladies de la Peau.*)

VI. DIAGNOSIS.

The only disease with which the measles are likely to be confounded is scarlatina. For the distinguishing characters between the two see Scarlatina.

VII. PROGNOSIS.

The prognosis in measles during the early stage of the disease is always favourable; but a mild attack of the proper symptoms is often suddenly converted into a most dangerous disease. It should be recollected that the eruption, or the mere disease, rarely puts the patient's life in hazard, as we so frequently observe in scarlatina, in which the vital powers are so alarmingly depressed by the action of the poison; but in measles the internal inflammation, particularly of the lungs, which frequently supervenes, is the chief source of danger. [Broncho-pneumonia is the most frequent cause of a fatal termination, hardly one out of four or five surviving this complication, according to Rilliet and Barthez. This, however, applies more strictly to hospital patients.] It is very generally admitted that measles are more severe, and attended with more danger in adults than in children. Dr. Montgomery dissents from this doctrine, and states that, as far as his experience enables him to judge, he should pronounce exactly a contrary opinion. (*Cyc. of Pract. Med.*) The most severe cases of measles which have come under our notice, have certainly been in adults. The character of the prevailing epidemic, and the peculiar type of continued fever of the same period, should be carefully weighed in forming the prognosis, as well as in determining the treatment of measles. The season of the year has a more important influence on the issue than on scarlatina or variola: the complaint is more likely to proceed favourably and safely in mild than in cold damp weather. When measles quickly succeed to other infantile disorders, as pertussis or remittent fever, the danger to be apprehended is greatly increased: the same may be said when it attacks children disposed to affections of the brain or to scrofula. The following are the general circumstances which denote danger:—unusual violence of the eruptive fever, especially if attended with spasmodic twitches or convulsions; the eruption appearing late, and of dark livid colour;

the supervention of thoracic or abdominal inflammation; severe headache, with nocturnal delirium; retrocession of the rash; extreme dyspnœa, coming on late in the disease with dusky flush on the cheeks and livid lips; the accession of typhoid symptoms; the appearance of petechiæ, or profuse hemorrhages from mucous surfaces.

A favourable prognosis may be pronounced when the eruption appears at the usual time, and proceeds regularly over the whole body and limbs; by the mildness of the bronchial affection; by the appearance of moderate diarrhœa; by the softness of the pulse; by the uniformly warm and moist state of the skin, and by the return of sound refreshing sleep.

VIII. CAUSES.

On this subject Dr. Williams states, "there is not any trace in medical history of the origin, or primary causes, of the measles. Aaron, a physician of Alexandria, cotemporary with Mahomet, and the first-mentioned writer on this subject, does not speak of the small-pox and measles as new or unusual diseases. Rhazes took it for granted that small-pox and measles were known to Galen more than 600 years before his time, being misled by some incorrect translation of Galen's works into the Arabian language. The passages which he quotes have certainly not the least relation to those diseases. Indeed, no description of them, nor the slightest collateral hint, appears in the writings of the Greek physicians, which could lead us to suppose they had any knowledge on the subject." Some modern writers have held a contrary opinion, and a controversy founded on very slight and unsatisfactory evidence, was carried on with ardour during a part of the last century, to which it is unnecessary more particularly to allude.

The measles, like scarlatina, now prevail in every climate, and at every season of the year, frequently without our being able to trace them to any particular source; so that we must infer that a morbillous poison is always in existence, and ready to infect the predisposed. It seems to be a law of this and similar poisons, that they vary greatly in intensity at different periods; and thus the measles are frequently observed to prevail epidemically rather than sporadically, breaking out with great violence for a certain time and then declining. The disease, however, is more common in open mild winters, and during the spring, than in the summer and autumn.

Though incident to every period of life, measles are more commonly observed in childhood, at which period the human constitution is very susceptible of this and similar diseases. It is admitted by all observers, that the body of a person labouring under rubeola generates a poison, which, either by contact or diffusion through the atmosphere, is capable of producing a similar disease. Measles are,

therefore, both contagious and infectious. The contagious nature of this disease has often been proved by direct inoculation, either with blood drawn from the arm of a morbillous patient, or with serum taken from the vesicles, which are occasionally intermixed with the eruption. Dr. HOME appears to have been the first who ventured, about the year 1750, to inoculate for measles with the blood of an infected person. His experiments have been repeated by VOGEL, BROWN, MONRO, and TISSOT, and the result led them to suppose that a mitigated and mild form of rubeola followed. Similar experiments, however, made by CULLEN, GIRTANNEC, ROSENTEIN, and VAIDY, were not attended by such mitigation of the symptoms, as in their opinions warranted the continuance of the practice. In the year 1822, however, Professor SPERANZA, in an epidemic which prevailed at Mantua, inoculated himself and six boys in the manner recommended by HOME; they all took the disease, which run a mild and regular course. (WILLIAMS, *op. cit.*) Dr. WILLAN inoculated three children with the fluid contained in the vesicles, which sometimes appear in the course of rubeola, but no effect was produced by the inoculation. He relates the case of a lad eighteen years of age, who was inoculated with this lymph and with vaccine virus on the same day. The vaccine vesicle ran its regular course, and after its decline on the sixteenth day from the inoculation, the primary fever of measles set in, which was followed by an attack of the rubeola vulgaris. Three children of another family were infected from him. [Dr. M. VON KATONA,* of Hungary, in a very malignant and wide-spread epidemic of measles in the winter of 1841, inoculated 1122 persons, with a drop of fluid from a vesicle, or with a drop of the tears of a patient with measles. It failed in seven per cent. of those on whom it was tried; but in all the rest the disease was produced in a very mild form, and not one of them died. At first a red areola formed round the puncture, but this soon disappeared; on the 7th day fever set in, with the usual prodromi of measles; on the 9th or 10th, the eruption appeared; on the 14th, desquamation commenced, with decrease of the fever and the eruption; and by the 17th, the patients were almost always perfectly well.] The general evidence in favour of the doctrine of the infectious nature of measles is strong, and is admitted by all writers. The rapid spread of the disease in families, schools, and other establishments for children, and the difficulty of protecting susceptible persons who happen to associate with the affected, are facts which establish the accuracy of this proposition.

It is rarely that individuals are affected by this poison twice in the course of their lives. Dr. WILLAN affirmed (*Medical Facts and Experiments*) that, after an attention of twenty years to eruptive complaints, he had not met with an individual who had twice suf-

* [Oester. Med. Wochensch., July 16, 1842, and British and Foreign Med. Rev., July, 1845, p. 211.]

fered from the rubeola vulgaris; but admits that those who have been attacked by the rubeola sine catarrho are not rendered insusceptible to a second attack. Dr. Home (*Trans. of a Soc. for the Imp. of Med. and Chir. Knowledge*), says that it was not uncommon for measles to attack the same person twice; and Dr. Baillie, whose authority may be esteemed equal to that of Willan, published two papers, which prove decisively that measles may occur a second time in the same individual, accompanied by their peculiar febrile and catarrhal symptoms. Similar cases are recorded by Dr. Webster. (*Med. Chir. Trans.*, vol. xxii.) It would thus appear that the poison of rubeola as well as that of vaccinia, variola, and scarlatina, may infect the human system a second time. The experiments, by inoculation, appear to prove that the poison is absorbed and carried into the circulation.

It is an interesting question, how long the poison remains latent before the special phenomena of the disease are manifested? Heberden saw four men that were affected with the disease on the tenth day after exposure to the infection, one on the thirteenth, and two on the fourteenth. Dr. Home, in his experiments, observed that the eruption appeared on the sixth day after inoculation. In the case of successful inoculation recorded by Willan, the disease commenced on the sixteenth day after inoculation, but the vaccinia ran its course in the interval. The period of latency, therefore, may vary from six to sixteen days. [MM. Rilliet and Barthez found, in one epidemic at the *Enfans Malades*, the period of incubation to vary from 12 to 29 days. Of 38 patients, whose duration of residence in the hospital prior to the appearance of measles had been noted, there were four in which the eruption appeared on the 4th or 5th day; eight from 9 to 13 days; twenty from 15 to 25 days; and six from 28 to 58 days. Dr. Bouchet, in an account of a slight epidemic at the Neckar hospital in 1843,* states that a child in the seventh day of the measles was brought into a ward in which there were nine little children, only one of whom had had the disease. Of the remaining eight, seven subsequently became affected; five of these, twelve days after the admission of the infected child, and the two others on 25th and 26th days. During the two months that the epidemic prevailed, 17 other infants entered the ward, of whom ten only contracted the disease, after remaining one 21, and the other 29 days, amid the infection. Succeeding new patients did not take the disease, nor did it pass into other wards, though they were only separated from the infected one, by a boarded partition. Dr. Guersant remarks that the accidental, as well as the natural predisposition should be regarded. In the examples above cited, the subjects of observation were already suffering from other diseases, which might have re-

* [Manuel Pratique des Maladies des nouveaux-nés et des Enfans à la Mammelle. Par E. Bouchet, Paris, 1845.]

tarded the appearance of the measles.] Various conjectures have been entertained respecting the state of the disease at which the virus of rubeola is generated. Many think that the poison is not disseminated till after the appearance of the eruption, while others believe this may take place during the primary fever. We incline to this latter opinion.

IX. TREATMENT.

The eruptive stage of measles, being seldom attended with danger, requires but little interference. It is chiefly necessary to pay attention to the regular action of the bowels, to confine the patient to bed in a moderate temperature, and to a light farinaceous diet, with cooling and demulcent drinks. The heat of skin about the period of the appearance of the rash is often considerable; but it is certain that the measles neither require nor bear the free application of cold to the surface of the body, which is so grateful and salutary in scarlatina, where the heat of skin is distressing; a cool apartment and light bed-clothes, with moderate allowance of cooling drinks, are all that is required. The remedies which are often administered at this stage of the disease, with the intention of exciting diaphoresis, are seldom attended with benefit; and the emulsions, which are so commonly prescribed, have but little control over the accompanying bronchial affection.

[The inhalation of the steam of mucilaginous decoctions, or even of boiling water, with or without the addition of a narcotic, the writer has found to relieve the distressing cough at the commencement better than any other means.]

The treatment now mentioned is in many cases all that is necessary throughout the course of the disease. Willan, however, adds that "an emetic given on the second or third evening somewhat alleviates the violence of the catarrhal symptoms, and contributes to prevent the diarrhœa which usually succeeds the measles." The mildness of the catarrhal symptoms should not lull the practitioner into security, but it should be remembered that active pulmonary inflammation may come on at any period of the complaint. It is generally upon the decline of the eruption that this danger is to be apprehended; but it is necessary to be alive to the possibility of pulmonary inflammation arising at any stage of measles, and by frequent examination of its physical as well as general signs, to detect its first approach.

The tendency to pulmonary inflammation has raised the question, whether bleeding ought not to be adopted as a precautionary part of the treatment of measles, or whether it should be postponed until pulmonary symptoms have come on? Sydenham was an advocate for bleeding in every stage of measles, when the eruption was at its height, when the difficulty of breathing and catarrhal symptoms

were urgent, and when the diarrhœa was obstinate. Dr. Heberden contends, that "bleeding with such medicines as the occasional symptoms would require in any other fever, is the whole of the medical cure requisite in the measles. (*Commentaries*, p. 321.) Cullen does not appear to have resorted to bleeding in measles, unless particular local symptoms rendered it necessary. Dr. Williams cautions the practitioner "to remember, even when these local lesions are most severe in measles, that they depend on the action of a morbid poison, have a certain course to run, and are consequently less amenable to antiphlogistic treatment than similar lesions depending on simple inflammation." (*Op. cit.*) Bleeding, therefore, is not to be regarded as a remedy always necessary in measles, although blood may be taken from the system with much less risk in this than in any of the eruptive fevers. In all cases where pulmonary inflammation exists, blood should be taken freely from the arm; but it should be remembered, that although some children bear the loss of blood well, there are many who are long in recovering from its effects, even when the quantity taken has been small; hence, in children of tender age, it is more prudent to take blood in small quantities by cupping, or by leeches applied to the chest, selecting some spot where there is a solid resistance to pressure, should it become necessary to restrain the bleeding. The quantity of blood taken should be more moderate during the eruption, than if the symptoms indicate loss of blood after its subsidence, because many urgent symptoms become mitigated when the rash disappears.

[The writer is disposed to look upon general blood-letting much less favourably and as less necessary than the author. He believes that in very few epidemics or individuals it is required. Local bleeding by cups or leeches, on the contrary, will often materially alleviate the more annoying symptoms; but even this should not be pushed too far.]

Antimony, ipecacuanha, and blisters, may be employed to assist the abstraction of blood. Sydenham prescribed an opiate every night throughout the whole course of measles; but in the early stages of the complaint, and particularly in children, it is seldom attended with beneficial results. As an occasional remedy in the latter stages, and where free depletion has been resorted to, as recommended by Sydenham, opiates may be useful. If the powers of the child do not forbid it, and there be no tendency to diarrhœa, one or two doses of calomel and rhubarb should be given at the termination of the disease.

The diarrhœa, which so frequently occurs at the close of measles, appears to alleviate the pulmonary symptoms, and, according to Bateman, "to prevent some other of the troublesome sequelæ of the disease." Hence this natural evacuation should not be arrested at once, but the secretions regulated by mercurial alteratives. If the diarrhœa be protracted, we may find it necessary to prescribe a few leeches or a blister to the abdomen, with slight astringents, an

occasional warm bath, and a farinaceous diet. Dissections (RAYER, *op. cit.*, *Rougeole*), after death have shown that, in such cases, inflammation of the mucous membrane of the intestines and enlargement of the mesenteric glands have existed.

It sometimes happens that the rash comes out imperfectly, or having appeared, suddenly recedes and disappears; if the retrocession have followed exposure to cold, the use of the warm bath, diaphoretics, warm and slightly stimulating drinks, and perhaps a mustard poultice to the chest or abdomen, are the remedies most likely to be beneficial; should it disappear from debility, a more stimulating plan must be adopted, not because the rash has suddenly disappeared, but on account of this condition of the general system, which, if allowed to continue, might hazard the patient's safety. Dr. BATEMAN once met with a case of this kind, where the fading efflorescence became mixed with petechiæ, and as there was apparently no local congestion, the decoction of cinchona with sulphuric acid and a little wine were administered, and the child speedily recovered.

TREATMENT OF MALIGNANT MEASLES.—When the disease presents this type, the mortality will be great under any plan of treatment. We believe that it is essential to seize the earliest opportunity of relieving the congested organs by a small bleeding, if the age and powers of the patient admit of loss of blood. The period when venesection may be employed quickly vanishes; typhoid fever supervening, the practitioner is restricted to local abstraction of blood. A nutritious diet, with the use of diffusible stimulants, as wine or ammonia, may be advantageously combined with depletion. If the typhoid symptoms be not urgent, but insidious pneumonia, or bronchitis, or gastro-enteritis, continue, they must be treated on the same principles as would guide the practitioner in the management of similar complications arising in common continued fever.

CHAPTER XII.

SCARLET FEVER.

[Syn.—*Scarlatina, Morbus scarlatinosus, Febris scarlatinosa, F. rubra, F. scarlatina, Morbilli confluentes, M. ignei, Ignus sacer; Scarlatine, Fièvre rouge, Fièvre pourprée,* Fr.; *Scharlachfieber,* Germ.]

The term (*Scarlatina*), for which there is no classical authority, appears to have been introduced into medical literature by Sydenham, A. D. 1670, and adopted by Morton and subsequent authors.

Scarlet Fever, or Scarlatina, is a febrile disease of a contagious nature, characterized by scarlet efflorescence of the skin and of the mucous membrane of the fauces, generally commencing about the second day of the fever, and declining about the fifth, being in most cases accompanied by inflammation of the throat, and occasionally of the submaxillary glands.

There is considerable difference in the type of the fever, which precedes and accompanies the eruption, which not only modifies the disease in individual cases, but influences also the general character of epidemics. Sometimes the febrile excitement is so slight, as to be scarcely perceptible; at others all the symptoms of active inflammatory fever are present; while it sometimes happens, that an epidemic has been stamped throughout by fever of a typhoid or malignant form.

The varying character of scarlet fever in different epidemics may, in some measure, account for the confusion which prevailed on this subject before the time of Sydenham, who had evidently witnessed its mildest forms only. Cases of a more severe description were certainly observed by Morton (*De Morbillis et Febre Scarlatina*), who regarded them as an aggravated species of measles, in which the eruption had assumed a confluent form. Subsequent authors continued to maintain the identity of scarlatina and measles, until the comprehensive description of scarlet fever by Dr. Withering and Dr. Willan appeared.

I. VARIETIES.

There are several forms of scarlet fever, each of which requires a separate description. It has already been stated, that the poison of scarlatina usually exhibits its effects upon two membranes; namely, on the skin and the mucous membrane of the fauces; to one or other of which, however, its action may be restricted.

Hence arise the varieties of scarlet fever, in accordance with a well-established law of the action of other poisons, "that they may exhaust themselves on one or more of the tissues they usually affect, without involving the whole series; and that they act with greater or less intensity according to the peculiar idiosyncrasy of the patient." (Dr. R. WILLIAMS, *Elements of Medicine*, vol. i. p. 131.)

In the most simple form of scarlatina the fever is seldom of an active kind; the cutaneous efflorescence appears in the usual manner, but there is no inflammation of the mucous membrane of the throat (*scarlatina simplex*).

In the second there is greater febrile excitement, and the general symptoms are further complicated by inflammation of the fauces (*Scarlatina anginosa*).

In the third the symptoms are of a more severe description. The fever, which is of a typhoid type, with great depression of the vital powers, is sometimes accompanied with diphtheritis, or sometimes with gangrenous imflammation of the throat, and generally with tumefaction of the parotid and cervical glands, and acrimonious discharge from the nostrils and ears (*Scarlatina maligna*).

In a fourth variety the efflorescence does not appear upon the skin, but is confined to the mucous membrane of the mouth and throat. Although this form has not been described by Dr. WILLAN as a distinct variety, it was often witnessed by him. (*On Cutaneous Diseases*, p. 273.) Dr. TWEEDIE, in his valuable essay on scarlatina, (*Cyc. Pract. Med.*,) has designated this variety *Scarlatina faucium*. Dr. WILLIAMS (*op. cit.*) has described it as *Scarlatina sine eruptione*.

A. SCARLATINA SIMPLEX.

This variety commences with the ordinary precursory symptoms of fever—cold chills, shivering, nausea and sometimes vomiting, succeeded by hot skin, frequent pulse, and thirst. In some cases the febrile disturbance is so trivial, as scarcely to be noticed; in others it is severe, the prostration becomes great, the pulse rises in rapidity, the heat of skin is pungent, and the headache is sometimes accompanied with transient delirium.

Some discrepancy of opinion prevails among authors respecting the period at which the efflorescence begins to appear. HEBERDEN asserts that it is visible on the first or second day. According to WILLAN (*op. cit.* p. 255), numerous patches of a vivid red colour appear about the face and neck on the second day; while CULLEN states that it is deferred until the third or fourth day. Another more recent and careful observer, Dr. TWEEDIE, makes the following judicious remarks on this subject:—"It is probable that in the majority of instances, the rash comes out on the second day of the fever; and that in cases in which it appears sooner or later, there is

some peculiarity in the individual or the disease to account for the variation." In cases in which we have had an opportunity of observing the disease from the commencement, the eruption has been visible on the face on the second day of the illness.

The rash at its commencement is perceptible on the face, neck, and breast, but gradually extends itself over the trunk and limbs, so that generally, after twenty-four hours, the whole body is covered with the eruption. The efflorescence consists at first of innumerable red points or spots, separated by interstices of skin of the natural colour. These small spots quickly coalesce, so that, in the course of a few hours, the redness is pretty generally diffused.

On the face, neck, and upper extremities, the efflorescence is uniform and continuous; but over the trunk it is diffused in large, irregular patches. It is of a more vivid hue on the loins, nates and the flexures of the joints, than in other parts of the body.

The efflorescence is often accompanied with a perceptible roughness, which is most evident upon the extremities and front of the body, giving a sensation as if the skin were covered with granules. It arises from enlargement of the cutaneous papillæ, and has the appearance of papular eruption. Where the congestion of the cutaneous vessels is very intense, and particularly where the patient has been subjected to a heating regimen during the treatment, small miliary vesicles occasionally appear on different parts, more frequently on the trunk. The rash on the fifth day generally begins to decline, the scarlet hue becoming gradually more pale; on the sixth day its appearance is very indistinct, and it is wholly gone before the eighth day.

About the fourth or fifth day of the efflorescence, an eruption of semi-globular vesicles, containing a thin pearl-coloured serum, has been occasionally observed about the forehead, neck, chest, shoulders, and extremities. They vary in size, and succeed one another without determinate order. When punctured they are sometimes found empty, or nearly so, the fluid having been absorbed.

The occasional appearance of these vesicles at the *acmé*, and during the decline of the efflorescence of scarlet fever, has been noticed by Withering, Willan, Rush (*Med. Obs. and Inq.*) and others. Vogel, Burserius, and Sauvages, from their occasional appearance, attempted to establish another variety of this disease, under the name of *Scarlatina pustularis variolosa.* We have seen cases in which this secondary eruption of vesicles closely resembled varicella in the form of the vesicles, and in the irregularity of their succession. Similar phenomena are occasionally observed in the other exanthemata: they probably depend upon the degree of congestion of the cutaneous capillaries in different cases.

The efflorescence in the scarlatina simplex commonly terminates by desquamation of the cuticle, which begins about the end of the fifth day on those parts where the eruption first appeared, and

gradually proceeds over the body in the same order as the rash came out. The desquamation from the face, neck and trunk, is usually in the form of scurf; while large portions of cuticle are detached from the hands and feet: occasionally the cuticle of the palm of the hand, or sole of the foot, is separated entire.

Such is the ordinary progress of the efflorescence on the surface of the body: but the mucous membrane of the mouth, fauces and nostrils, is generally more or less affected at the same time; the lips, the edges of the tongue, the soft palate, the pharynx, the nostrils, and even the internal surface of the eyelids, being of a bright red colour. The papillæ of the tongue become considerably elongated, their red points projecting through the thick mucus which covers its surface; when that organ is clean, or morbidly red, the elongated, enlarged, and deep scarlet papillæ give it a very characteristic appearance.

The affection of the mucous membrane of the mouth and fauces, which is not constant in the scarlatina simplex, terminates by resolution; and with the disappearance of the rash the febrile symptoms subside, the disease terminating at the end of a week, though it often leaves the patient in a state of considerable debility.

B. SCARLATINA ANGINOSA.

In this variety the precursory symptoms are more violent than in the preceding. In some cases the first symptom is sudden stiffness of the muscles of the throat and angles of the jaw, accompanied by uneasiness in swallowing, which on the second day becomes more painful and difficult, the sufferings of the patient being rendered more distressing by constant efforts to expel a viscid secretion from the mucous crypt of the tonsils and pharynx. Upon examining the throat, there is considerable swelling of the tonsils, uvula, and soft palate, with florid redness of their surface, which extends to the posterior part of the fauces. In severe cases small patches of a darker hue are observed on the inflamed membrane, at which points there is often an exudation of a coagulable lymph, of a grayish-white appearance, which, unless examined with care, may be mistaken for sloughs of the mucous lining; but by directing the patient to clean his throat by means of a gargle, by which this exudation may be removed, the mucous membrane will be found entire, and free from any loss of substance. These crusts of lymph, which are renewed from time to time, extend, according to Rayer, (*Traité des Maladies de la Peau*,) into the lateral parts of the pharynx and œsophagus, but not into the larynx or trachea. This coincides with the observation of Dr. Tweedie, who states that in the dissections of scarlatina anginosa which he has made, he has not seen an instance of membranous exudation extending to the larynx.

In some cases the fever precedes or accompanies the sore throat; in others it is delayed until the appearance of the efflorescence. It is generally, from its commencement, of a more active kind than in scarlatina simplex, indicating a severer form of disease. On the second or third day, as the inflammation of the throat becomes more urgent, there is generally a considerable increase of the febrile excitement; the debility is greater; the pulse more frequent and of unequal strength; the respiration oppressed; the temperature of the skin rises to 106° or 108°, sometimes to 112°; there is urgent thirst; and the tongue, especially at its tip and edges, assumes a scarlet hue, while its papillæ are much enlarged. As the evening approaches, there is an exacerbation of fever with extreme restlessness, and often delirium, during the night.

In this variety, the efflorescence does not observe the same regularity as in the scarlatina simplex. It does not appear so early, but is often delayed to the third or fourth day, and generally comes out in scattered patches on the chest and arms. In some cases it is entirely confined to the back of the hands and wrists, and sometimes wholly vanishes the day after its appearance, and reappears partially at uncertain times, so that its whole duration is longer than in scarlatina simplex. About the fifth or sixth day it begins to grow sensibly paler, following the same order in its decline which it had previously observed on its appearance, subsiding first on those parts which it had primarily occupied. Desquamation of the cuticle frequently follows the disappearance of the rash, though this is by no means an uniform occurrence, seeming in some measure to depend on the intensity or duration of the previous eruption; for when the latter has been slight and of an evanescent character, desquamation seldom follows.

The fever and inflammation of the throat begin to abate with the fading of the eruption, though sometimes the sore throat and some degree of fever continue for a week or ten days after the rash has entirely disappeared.

The above description is intended to apply to scarlatina anginosa, as it is usually observed. It sometimes, however, assumes an aggravated form; thus, in addition to the symptoms already enumerated, there is sometimes acrid discharge from the nostrils and ears, frequently accompanied with deafness or inflammation of the parotid and cervical glands, terminating in suppuration of the cellular tissue. But although these occasional complications tend to keep up the febrile excitement, and to prolong the duration of the disease, they do not materially add to the danger, as they generally subside in a few days after the disappearance of the more characteristic symptoms of the disease.

During the progress of scarlatina, the attention of the practitioner should be constantly directed to the state of the internal organs. Dr. Tweedie, in enumerating the complications of scarlatina, directs attention particularly to the great disposition to inflam-

mations of the serous membranes; so that, when an organ becomes inflamed during the progress of scarlet fever, the serous membrane is much more generally the seat of inflammation than the parenchyma. There are few practitioners who have had much experience of scarlet fever, who have not had cause to lament the loss of patients from meningeal, pleuritic, or peritoneal inflammation.

C. SCARLATINA MALIGNA.

This variety, proposed by Dr. Willan and adopted by subsequent writers, was described by Cullen under the title of *Cynanche maligna*. A reference to his description will all at once show that he described a severe form of scarlatina. Dr. Fothergill, in his *Account of the Sore-throat attended with Ulcers*, which prevailed as an epidemic in London in the years 1747–8, has also described this malignant form of scarlatina; and the epidemic which prevailed from 1751 to 1753, of which Dr. Huxham has given an account, (*On Fevers and Sore-throat*,) was undoubtedly the scarlatina maligna of Willan: indeed, in his *Essay on the Malignant Ulcerous Sore-throat*, he admits its great resemblance to scarlatina anginosa; and that "truly some of the scarlet fevers mentioned by Morton were not much unlike it."

Although at its commencement the symptoms of scarlatina maligna differ little from those of the scarlatina anginosa, yet at an early period its formidable nature becomes apparent. Thus the fever assumes a typhoid form, the heat of skin is less intense, and there is great disorder of the functions of the sensorium, with small, frequent, and often irregular pulse. There is at the same time dull redness of the eyes, with a dark red flush on the cheeks; the patient is restless, fretful, and at times delirious; the delirium is sometimes violent, but more generally it is of the low muttering kind. The tongue quickly becomes dry and brown, or red, dry and glazed, and often so tender and chapped, that a slight touch causes it to bleed; the teeth and lips are covered with sordes, and the odour of the breath is extremely fetid. The throat has a dusky red appearance; there is not much swelling, but dark incrustations form on the velum, uvula and tonsils, which are not, as has been generally supposed, sloughs, but merely exudations of lymph or false membranes. In some cases, however, there is gangrenous inflammation of these parts, which are destroyed by the sloughing which succeeds. There is, at the same time, acrid excoriating discharge from the nostrils, and a viscid secretion from the fauces, impeding respiration and producing a rattling noise. The inflammation in severe cases spreads to the posterior pharynx, which, though not much swollen, is so irritable, that on attempts to swallow fluids they are rejected through the nostrils. The inside of the lips and cheeks is frequently covered with aphthæ, and the cervical and submaxillary glands

become inflamed, abscesses occasionally forming in the surrounding cellular tissue.

The rash is extremely irregular as to the time of its appearance and duration. It often comes out at a late period of the disease, and disappears after a few hours; or it vanishes suddenly, and is again renewed several times in the course of the disorder. Its colour is generally paler than in the other varieties, except that here and there, in irregular patches, it assumes a deeper hue. In some cases there is great tendency to hemorrhage from the mucous surfaces, either from the nostrils or throat, intestines or urinary canals; petechiæ often appear upon the skin and the patient gradually sinks, unless the constitution has been previously very vigorous. Dr. Tweedie has, in a few instances, seen the large joints become extremely painful and swollen with evidence of fluctuation; the patient is generally destroyed in a very short time. Patients who withstand the violence of the early symptoms, have often to struggle against a series of most untoward circumstances for a considerable time. Some die from exhausting diarrhœa; others sink suddenly and unexpectedly, after giving hope of recovery; sometimes death takes place from the supervention of serous inflammation and its consequences. Even when scarlatina at its onset has been of the mildest form, it sometimes happens that its whole aspect becomes suddenly changed, and the symptoms assume a malignant character; and when the disease is epidemic, it often exhibits, in different persons of the same family, every gradation from the slightest to the most malignant form of the disease.

In many instances this malignant variety of scarlatina terminates fatally on the third or fourth day, and Dr. Willan says, "as early as the second day, no symptoms having preceded which could excite an apprehension of immediate danger." In the severe epidemic described by Dr. Withering, similar instances are recorded. Dr. Tweedie describes cases terminating fatally "on the second, third, or fourth day, without the practitioner being able to assign any satisfactory reason, or discover any lesion on the most careful examination of the body." These opinions are confirmed by the observations of Mr. Hamilton (*Edin. Med. and Surg. Journ.*, vol. xxxix.), and by Dr. Sandwith, in his account of the Bridlington epidemic. Dr. Willan has justly remarked, that in cases terminating fatally so soon after the accession of the fever, the throat has probably been longer affected, and that the poison had gradually pervaded the whole constitution; hence the sickness, shiverings, languor, delirium, and coma, do not, in such instances, denote the commencement of the fever, but are the final symptoms of an insidious and most virulent distemper. We have met with a few cases of this description which terminated rapidly with œdema of the face and profound coma.

D. SCARLATINA SINE EXANTHEMATE.

In this form, the specific action of the poison is limited to the mucous lining of the mouth and fauces, the scarlet efflorescence of the skin being wanting. Cases of this description frequently occur when the disease prevails epidemically. It was the opinion of Dr. Willan, that this complaint was peculiar to adults; we have, however, known a case in a child of five years, which terminated fatally.

When scarlatina exists as an epidemic, this variety is sometimes observed simultaneously with the other forms of the disease in individuals of the same family. Dr. Willan contends, that "it is evidently a species of scarlatina, because it affects some individuals of large families, while the rest are labouring under other forms of scarlatina, *and because it is capable of communicating by infection all the varieties of that disease.*" The author has had good opportunities of confirming this opinion of Dr. Willan. The same learned writer thus continues, "Persons who have previously gone through the scarlatina anginosa, experience, while conversant with the sick, very uneasy sensations in the throat; in some there is an inflammation and swelling, or ulceration, of the tonsils, producing considerable pain and irritation, but without the specific fever and efflorescence." Dr. Johnstone, in his description of the epidemic which prevailed at Worcester in 1778, states, that while some individuals at the first seizure were covered with the scarlet efflorescence, others of the same household had the ulcerated throat without any eruption of the skin; and that in some instances, patients suffering from anginose inflammation without the rash, have communicated the disorder to others, in whom it has appeared as an eruptive disease. Dr. Tweedie has recorded similar instances. "It may appear singular," says Dr. Willan, "that one of the slightest of the eruptive fevers and one of the most violent, that epidemics which vary as much in fatality as a flea-bite and the plague, should be associated together and spring from the same origin. Experience, however, decides that the scarlatina simplex, the anginosa, the maligna, and the scarlet sore-throat without the efflorescence on the skin, are merely varieties of the same disease; and that all of them proceed from the same source of contagion."

II. SEQUELÆ.

It often happens, when scarlatina is apparently advancing towards a favourable termination, that recovery is retarded, and sometimes even life destroyed, by the supervention of certain local affections, which are to be regarded as accidental complications or sequelæ. Some of these have already been adverted to. The

great tendency to inflammation of the pleura, peritoneum, and more rarely of the arachnoid and pericardium, in the course or during the decline of the fever, has been mentioned. In certain epidemics, moreover, the disease is prolonged, and its mortality increased by the supervention of bronchitis or gastro-enteritis. More rarely still the disease is followed by purulent deposits in the large joints, or by gangrene of some portions of the extremities.

[Dr. Golding Bird states that he has witnessed in a few cases a rather anomalous set of symptoms following scarlatina, and accompanied, in at least two instances, by coagulable urine without anasarca. These appeared referrible to peculiar pains, at first sight, apparently, of a rheumatic character, limited almost entirely to the lower limbs. As, in all these cases, the patients were young children, it was difficult to form a correct notion of the character of the pain. There was no tumefaction or redness of the joints, nor much pain evident on pressing or moving the limbs; the little patient merely crying out frequently with "pain" in the legs, which, from its occurring in paroxysms, and not being constant, appeared to be of a spasmodic or cramp-like character. These symptoms all yielded to the warm-bath, antimonials, and sometimes to a little iodide of potassium.]*

Dropsy is an occasional consequence of scarlatina. It occurs more frequently in the form of anasarca of the face, eyelids, and lower extremities; but occasionally becomes general. Sometimes the effusion takes place in the different serous cavities; and, when this happens, the result is very doubtful. Dropsy succeeding to scarlatina is noticed by many writers, who appear to have arrived at very different conclusions as to its importance; Morton, the first English author who has given a full account of scarlatina, notices it, and evidently regarded it as of serious import. (*Op. cit.*, cap. iv.)

In the account of scarlatina, as it prevailed at Vienna in 1762, Plenciz states, that the dropsy which succeeded the disease was more dangerous than the primary fever. (Willan, p. 235.) Drs. Sims and Wells, however, who published histories of the epidemic scarlatina of 1786, appear to think anasarca a symptom of trifling importance. (*Trans. of Soc. for the Imp. of Med. and Surg. Knowledge*, vol. iii.) Cullen, Bateman, and Armstrong, pass over this complication with slight notice. Dr. Blackall (*Observations on Dropsies*) first observed the albuminous state of the urine in many of these cases; and the subject has recently acquired fresh interest and importance by the discovery of Dr. Bright, that albuminous urine is frequently associated with structural changes in the kidneys. It is singular that the dropsy has been remarked to succeed to the mild as often as to the severe forms of the disease; and that it has never been observed to supervene in cases of scarlatina maligna. Children are much more frequently attacked than adults, but it is more common in the latter than is usually supposed.

* [Guy's Hospital Reports, April, 1845, p. 138.]

It generally comes on in ten or twelve days from the disappearance of the rash, but sometimes earlier and sometimes later. Its approach is generally announced by paleness of the countenance, a leucophlegmatic aspect, increasing languor, loss of appetite, furred tongue, costive bowels, scanty and turbid urine, and often considerable gastric disturbance. The swelling more frequently begins on the face and hands, to which it may be confined; but in general it extends till the whole body becomes œdematous. There is but little to be apprehended so long as the serous effusion is confined to the subcutaneous cellular tissue; but when it takes place in the cavities, the danger is imminent. When the fluid is effused into the ventricles of the brain, the swelling of other parts of the body often partially subsides. Drowsiness, coma, and convulsions supervene, which generally prove fatal. Another source of danger is the rapid accumulation of fluid in the chest, which is commonly preceded for some time by general anasarca, and the suddenness of the effusion is in some cases remarkable. As serous effusions are to be regarded as secondary affections resulting from some previous morbid action, it is of importance to ascertain their cause. On this subject Dr. Blackall remarks, "There is something hitherto obscure in the disposition to œdema which scarlatina leaves. The time, the symptoms, and the subjects of this attack, by no means permit the opinion that it originates in mere debility. On the contrary, the attendants are often persuaded that the patient has caught some fresh cold; and it is certainly not improbable, that the previous inflammation and irritation of the skin may be followed by an opposite state of it, incapable of supporting even the common changes of temperature."

Dr. Tweedie regards the dropsy as arising from increased action in the sanguiferous system. That this is the cause of the effusion, if not invariably at least in the majority of instances, and certainly in all those which have come under his observation, was evident from the character of the pulse as to frequency and power, the coagulable urine, the rapidity with which the fluid accumulated (if not arrested by prompt treatment), and from the efficacy of blood-letting, purging, and other antiphlogistic measures, which were generally necessary to remove the dropsical effusion. We fully coincide in the opinions of these two practical physicians. Mr. Hamilton has attempted to show that the kidneys exhibit traces of commencing disorganization, and thus to account for the dropsy and albuminous urine. (*Edin. Med. and Surg. Journ.*, vol. xxxix.) But it is now well known, that the albuminous urine may be secreted where the structure of the kidney is healthy; and no instance is known of recovery from dropsy with granular degeneration of the kidney, but recovery from dropsy after scarlatina is frequent.

[Scarlet fever being essentially a blood-disease, the effects of the poison, as has been justly observed by Dr. Golding Bird,* is a

* [Guy's Hospital Reports, April, 1845, p. 136.]

determination of blood towards the cutaneous and mucous surfaces, shown by the characteristic rash covering the one, and the erythismic state of the other, many of the glandular structures partaking of this congestion. If the eruption is fully developed, the effects of the poison become exhausted. But if the effects of the scarlatinal poison are interfered with by any irregularity in the cutaneous affection, the poison not being completely eliminated, some of the recognized after effects result.

"In what manner," Dr. BIRD inquires, "does the presumed relict of scarlatinal poison act in producing the peculiar after effects of the disease? Granting, then, the existence of an imperfectly exhausted *materies morbi* in the blood after the disappearance of the incompletely-developed exanthem, attempts will be made to excrete this matter, under some form or other, by one of the different emunctories of the body. That the skin is adequate to this task is rendered probable by the fact before alluded to, of the extreme rarity of scarlatinal anasarca in those cases in which a perspirable, or at least freely exfoliating state of surface has been obtained within a few days after the recession of the rash on the skin. When the determination of blood to the cutaneous capillaries has not been sufficient to allow of the excretion of the poison by the skin, or when it has experienced the astringent influence of cold, or perhaps even of inattention to cleanliness by the omission of frequent ablutions of warm water, an attempt is made to get rid of the relict of the disease by some other outlet. From the researches of WOHLER and others, with which the profession is perfectly familiar, it seems demonstrable, that, as a general rule, all effete matters existing in solution in the animal fluids are excreted by the kidneys. Accordingly, a large supply of blood is sent to these organs, their capillaries become dilated, and congestion occurs. The almost necessary result of this pathological condition of the kidneys is a double lesion of their function. An exudation of the albuminous elements of the blood occurs, and renders the urine coagulable, its tint being often darkened by an admixture of red particles; whilst, on the other hand, the kidneys cannot carry on their important depurating functions perfectly, they eliminate but imperfectly the nitrogenized effete elements of the blood, and hence one or more of the normal constituents of the urine are detectable by chemical analysis in the circulating mass. Cotemporaneously with these lesions, more or less effusion into the loose subcutaneous cellular tissue, to a varying amount, generally but not necessarily occurs."

Dr. BIRD expresses his conviction that the train of effects following scarlet fever is due to the retention of the nitrogenized elements of urine in the blood. This conclusion, he thinks, is justified by the analogy existing between the disease under consideration and albuminuria, in which the existence of effete nitrogenized matter in the blood is, at least in several of its phases, a necessary accompaniment. The recognizable sequelæ of scarlatina referrible to this

category are characterized by a tendency to the supervention of serous inflammation, particularly of the pleura, arachnoid, and pericardium. Besides insidious arachnitis, there is another form of head affection of occasional occurrence, closely resembling that pointed out by Dr. Bright as peculiar to albuminuria—a state characterized by the occurrence of quiet stupor, or epileptiform convulsions, generally ending fatally. Several cases of this kind were published by Dr. Bird some years since.* *Pericarditis* is by no means an unfrequent complication of scarlatina. Dr. Bird states that scarcely a month passes over that he does not meet with cases of heart-disease consecutive to pericarditis following scarlatina. Many of the best authorities on the practice of medicine, however, make no mention of pericarditis as a complication of scarlet fever; and Dr. Watson observes, that the affections of the joints similative of rheumatism, occurring in the course of scarlatina, may be distinguished from true rheumatism by the absence of cardiac implication.† But on the other hand, MM. Rilliet and Barthez, Drs. Joy,‡ Robert Willis,§ Copland, Professor Von Ammon, of Dresden,‖ Puchelt, and more recently Dr. Scott Alison,¶ confirm the statement of Dr. Bird. Dr. Alison's paper, especially, is highly interesting and satisfactory, being accompanied by several illustrative cases.]

[III. STATE OF THE BLOOD.

Andral and Gavarret have made four analyses of the blood of three persons suffering from scarlatina. Two of these analyses decidedly indicate the character of hypinosis, although not in a very marked degree. The two other cases present differences which will be presently explained.

Venesection.		Water.	Fibrin.	Blood-corpuscles.	Residue of serum.
1st Case	1	761·5	3·1	146·0	89·4
	2	782·6	4·0	124·3	89·1
2d "	1	776·3	3·5	136·1	84·1
3d "	1	798·3	6·8	112·2	82·7

The first bleeding in the first case was ordered on the second day of the eruption; the second during convalescence. At this period a number of boils had appeared, and there was considerable fever, to which two circumstances the change in the blood is attributable.

The bleeding in the second case was ordered on the second day of the eruption.

* [London Medical Gazette, June, 1840, p. 432.]
† [Watson's Practice of Physic, 2d Am. ed. p. 1031.]
‡ [Library of Practical Medicine, 2d Am. ed., vol. ii. p. 524.]
§ [London and Edinburgh Journal of Medical Science, No. X.]
‖ [Analekten über Kinder Krankheiten. Stuttgart, 1837.]
¶ [London Medical Gazette, Feb. 1845, p. 664.]

Lecanu* has also made two analyses of the blood in this disease, and has obtained nearly similar results.

	Blood of a man aged 35 years.	Blood of a man aged 18 years.
Water - - - -	776·55	770·41
Blood-corpuscles - - -	144·55	146·80
Residue of serum - -	78·90	82·70

The quantity of fibrin was not determined by Lecanu.]

IV. ANATOMICAL CHARACTERS.

The morbid appearances on the dissection of fatal cases of scarlatina are by no means uniform. Dr. Tweedie states, that he has frequently been surprised, in examining rapidly fatal cases, to find no morbid appearances that could explain the cause of death: in such instances, it is more than probable, that the diseased condition of the blood and fluids has had an important share in the fatal issue. The most uniform specific action of the poison during life is upon the skin, producing the exanthema or rash; but as this consists simply of intense congestion of the cutaneous capillaries, it speedily vanishes after death. The skin in some places is florid, of a dark red colour; and in others there are livid spots and petechiæ, these latter being produced by extravasation of blood into the cutaneous and subcutaneous cellular tissue. In fatal cases of scarlatina anginosa, dissection often reveals a congested state of the mouth and pharynx. These organs exhibit a deep red tinge, which in some instances extends to the trachea and bronchi: there is generally swelling of the tonsils and the adjacent parts, which are frequently covered with coagulable lymph. In scarlatina maligna, however, these appearances are not observed, or at least, the tumefaction of the throat is generally trivial; but the lining membrane has a dark livid colour, sometimes abraded, and frequently covered with exudations of dark-coloured lymph, which have often been mistaken for sloughs. It often happens, however, even where the inflammation of the throat has been most severe and distressing during life, that no traces of its existence are discoverable after death.

In some epidemics it has been observed, that the inflammation of the mucous membrane is much more extensive. In the epidemic which prevailed in Edinburgh during the autumn of 1832, described by Mr. Hamilton, and wherein he attended 150 patients, almost every severe case had more or less of the chest affection; and he mentions only one fatal case, in which it was not evident from the appearances after death, that violent inflammation had extended to the larynx, trachea, and lungs. (*Edin. Med. and Surg. Journ.*, vol. xxxix.)

* [Etudes Chimiques, etc., p. 97.]

The abdominal viscera are rarely affected, although occasionally the mucous membrane of the intestinal canal is red and injected: sometimes the peritoneum exhibits marks of previous inflammation, with effusion of fluid into the abdominal cavity.

[It has been asserted by some recent authorities that the intestinal follicles, especially the agminate, are often found to be enlarged and inflamed. Dr. Grisolle states that he has never been able to verify this statement in any of the autopsies that he has made. (See p. 238.)]

The appearance of the kidneys is not uniform, apparently depending upon the existence and duration of dropsy. Where patients have sunk early in the disease, these organs have generally been found healthy; in protracted cases, they sometimes exhibited a mottled and granulated appearance. When dropsy had appeared before death, Mr. Hamilton [F. Fischer, and Rayer], found the alterations in the kidneys much more decided, presenting the appearance of the first stage of *Bright's disease*, the alteration of structure being generally in proportion to the duration of the disease. The cortical substance, however, never presented, except very slightly in one case, the granular appearance seen in the more advanced stages of Bright's disease; nor was the tubular structure ever encroached upon, which is, perhaps, from the recentness of the attack, just what we should expect. Should these apparently progressive alterations of structure, in cases of dropsy with albuminous urine consecutive to scarlatina, be confirmed, the highly probable opinion entertained by Dr. Graves will be strengthened, viz., that the mottled degeneration of the kidney (Bright's disease) is not to be regarded as the cause of the secretion of albuminous urine; but, on the contrary, that it is the progressive and long-continued faulty elimination of albumen with the urine, which produces the gradual change in the cortical portion of the kidney.

When the primary fever has terminated fatally after violent delirium, Dr. Tweedie has found the arachnoid membrane vascular or even opaque, with effusion of a serous or sometimes milky fluid underneath: in such cases, the substance of the brain is also congested.

When purulent deposits take place in the joints, a morbid condition observed in the London Fever Hospital, there are rarely marks of inflammation in the synovial membrane. Dr. Tweedie is inclined to think, that the pus deposited in the joints is not the consequence of inflammatory action, but that it is deposited from the blood, in the same manner as is sometimes observed in other parts of the body.

V. CAUSES.

Epidemic scarlatina occurs more frequently in the autumn months after a warm summer, especially when the heat has been

accompanied with continued rains, and when the succeeding winter has been open and mild. It generally disappears during the spring months, though in some epidemics, it prevails in every month of the year. It occurs more frequently in the early than in the advanced periods of life, and in females than in males; so that childhood and the female sex appear to be more predisposed to the disease than manhood and the male sex. Children and females are much more exposed to the influence of the poison than men, and perhaps all children are susceptible of the influence of the poison; whereas, many adults having passed through the disease in childhood, may be said to be almost exempt from future attacks.

Dr. Clark has given a tabular view of the cases under his care in 1778 and 1779, from which it appears that children under ten years of age were most liable to the disease; that under twenty years of age, the number of males and females was almost equal; but that above this period, the number of females greatly exceeded that of the males. (Cited by Willan, p. 344.) Dr. Tweedie has given a similar table of cases of scarlatina admitted into the London Fever Hospital, from which (omitting the cases under ten years of age, as few of that age are admitted into the metropolitan hospitals,) the same results are obtained. Of 146 cases given by Dr. Clark, there were 66 males and 80 females; and of 184 cases given by Dr. Tweedie, there were 55 males and 129 females. It further appears, that the susceptibility to the disease diminishes in a very considerable degree after the age of 30; for of Dr. Tweedie's cases (184) there were only 22 between the ages of 30 and 50.

Scarlatina appears to be a contagious as well as infectious disease. Its contagious nature has been demonstrated by inoculation. The serum of the vesicles, which sometimes appears in scarlatina, has been used by Sir Busick Harwood, late regius professor of physic at Cambridge, and other physicians, to inoculate healthy children, in the hope of producing a mild form of the disease. In many instances, the disease has been produced, but has proved to be as severe as that which occurs spontaneously. (Williams' *Elements of Medicine*, p. 118.)

The infectious nature of scarlatina is a doctrine scarcely disputed in the present day. The rapid spread of the disease in schools, and its frequent communication to healthy members of families when children have returned home labouring under the disease, or during convalescence, though several weeks may have elapsed from the period of desquamation, are among the more obvious proofs of its infectious nature. It is also the opinion of those who have had much experience of this disorder, that clothing, bedding, or furniture of a room, which have been used by patients during this disease, are all capable of infecting healthy individuals. It was the opinion of Dr. Willan, founded upon an experience of 2000 cases, that scarlet fever having once run its course, the constitution was afterwards insusceptible to a second attack. Exceptions to this supposed law,

however, are numerous; those who have once experienced the specific actions of the poison, when exposed to its influence at some future period, are not unfrequently attacked with *Scarlatina sine exanthemata.* Sir Gilbert Blane met with an instance of its occurring thrice in a young lady, "without the least suspicion of ambiguity or possibility of mistake." (*Med. Chir. Trans.*, vol. iii.) Analogous instances of the recurrence of small-pox, and other exanthemata, might be adduced in support of this statement. The period which elapses *after exposure to the influence of the poison*, before it produces its specific effects, probably varies from twenty-four hours to about ten days. In one case, in which the virus was introduced by inoculation, Rostan says, that seven days elapsed before the appearance of the eruption. (*Clin. Méd.*, tom. ii., p. 206.)

VI. DIAGNOSIS.

The only diseases with which scarlatina may be confounded, are measles and roseola. From measles it may be distinguished by the precursory symptoms; by the time intervening between the first accession of fever, and the appearance of the rash; by the character of the eruption; and by the sequelæ. Measles commences with coryza, sneezing, suffusion of the eyes, cough, slight dyspnœa, and other catarrhal symptoms; while in scarlatina, the first sensation of uneasiness is referred to the throat. The eruption in measles shows itself on the fourth day of the fever, but in scarlatina it may usually be distinguished on the second. In measles the rash is disposed in irregular portions of a crescentic form, and is slightly elevated, so as to be sensible to the touch; in scarlatina the eruption assumes the appearance of broad patches of an indeterminate shape. The rash has a different tint in the two diseases; it is of a vivid red in scarlatina, but of a darker or raspberry hue in measles. In scarlatina the fever does not abate upon the appearance of the eruption to the same extent as in measles; the former is frequently succeeded by anasarca, inflammation of serous membranes, depositions in the joints, &c. The sequelæ of measles are principally affections of the respiratory organs, as bronchitis, pneumonia, croup.

Roseola is distinguished from scarlatina by the partial and regularly defined rash, by the absence of the angina, by the mildness of the febrile disorder, and by the short duration of the complaint. Deep rose-coloured patches, exactly like roseola, sometimes appear intermixed with the rash of scarlatina.

VII. PROGNOSIS AND MORTALITY.

The only danger to be apprehended in scarlatina simplex is the occurrence of some internal local inflammation, or the superven-

tion of anasarca, when the desquamation of the cuticle is completed. It must also be borne in mind, when scarlatina prevails epidemically, that a mild case sometimes suddenly assumes a malignant type. [It should be recollected that the sequelæ are much more frequent after mild cases of scarlet fever than severe ones. This should render a prognosis very guarded.] The prognosis in scarlatina anginosa is influenced chiefly by the extent and severity of the local inflammation, bearing in mind, however, that there is a natural tendency in angina to terminate in resolution. A bright florid appearance of the inflamed mucous membrane is a more favourable symptom than when it presents a dark livid aspect. But if there is excessive tumefaction of the throat and surrounding parts, and especially if the inflammation has extended to the air tubes, the disease is to be considered dangerous, and will probably terminate fatally. In some cases of this kind, œdema of the glottis supervenes, and rapidly destroys the patient. The prognosis is also unfavourable if the delirium commences, as it frequently does in children and young persons, a few hours after the seizure: in these cases a fatal result often ensues in the course of two, three, or four days. Our prognosis may often be formed from the character of the eruption. A bright red efflorescence is more favourable than a pale rash, or a dusky red, or one of a raspberry tint. When the eruption is partial and evanescent, or when its retrocession takes place suddenly at an early stage without reappearing, there is much cause for apprehension. Complete desquamation of the cuticle is a favourable sign. Scarlatina maligna being always attended with great danger, a guarded prognosis should be given.

Of the circumstances indicating a minor degree of danger, the following are the more important. It is generally supposed that children withstand the virulence of this disease better than those of more advanced age. The absence of visceral inflammation, or of structural disease of any important organ, will also lessen the danger. A plentiful and florid eruption, a bright red colour of the fauces, and a disposition of the exudations on the throat to separate, universal desquamation of the cuticle, the pulse falling in frequency and rising in power, the breathing becoming gentle and free, the countenance resuming its natural expression, and gentle perspiration, are indications of a favourable result.

Among the unfavourable signs are the existence of inflammation in an important organ, for the subduing of which active remedies cannot be employed; a dark or livid appearance of the eruption, more especially when intermixed with petechiæ; the sudden disappearance of the efflorescence; a small, frequent pulse, with great prostration of strength; hurried respiration not depending on active inflammation of the lungs; acrid discharges from the nose and ears; the admixture of blood in the urine or stools; involuntary evacuations; subsultus tendinum; hiccough; muttering delirium

and coma; the appearance of gangrene of those parts subjected to pressure, or in the extremities.

In conclusion it may be remarked, that it is often a fatal disease when it attacks pregnant or puerperal women; and that it is generally of a milder character in the spring and summer, than in the autumn or winter months.

Hitherto we have no sufficient data for arriving at any safe conclusions respecting the *mortality* of scarlet fever. In some epidemics the disease is remarkable for its benign character, scarcely affording a single example of a fatal termination; while in others it destroys whole families, and threatens large districts with depopulation. Sydenham, who had evidently observed the milder forms of the disease only, believed scarlet fever so trifling an affection as seldom to require medical interference, and that fatal results could alone occur from the *nimia medici diligentia*. Morton, on the contrary, having had his attention directed to an epidemic of extreme violence, is perhaps inclined to overrate the average mortality of the disease. A short notice of each of the most important epidemics that have prevailed during the last two centuries will be found in Dr. Williams's learned and elaborate work; and since the publication of that work, various monographs have still further enlarged our knowledge on this subject.

VIII. TREATMENT.

In commencing this branch of our subject, it is necessary to mention a point of the utmost practical importance, namely, that in every instance the prevailing type or character of the continued fever of the period should be taken into consideration, and that the treatment found most successful in the latter, should be a guide to the practitioner in forming the principles upon which the cure of scarlatina should be attempted.

1. In *scarlatina simplex* of a mild character but little treatment is requisite. The patient's apartment should be kept cool and well ventilated. The diet should consist of farinaceous substances and cooling drinks; emetics may be given with advantage at the commencement of the fever. The bowels should be kept open with mild aperients. When the heat of the surface is great, patients often experience much relief from sponging the body with cold water, which is sometimes followed by refreshing sleep. In strong and plethoric subjects, when the fever is high, the abstraction of blood, either from the arm or locally, may be employed as a precaution against internal inflammation, which in such cases is always to be apprehended. But however mildly this form of the disease may commence, it nevertheless requires to be watched, for it is surprising how rapidly it is often converted into the more severe

inflammation of an internal organ, or anasarca may supervene when least suspected.

2. In *scarlatina anginosa* we have distinct local inflammation, and fever of a more active type to contend with. The question then naturally arises, is a disease attended by such symptoms to be treated like other inflammations, by bleeding and other antiphlogistic remedies? or is there anything specific in the local phenomena of scarlatina which requires a modification of such treatment? The solution of this interesting problem must of course be determined by a reference to results obtained by eminent physicians from different methods of treatment. Dr. R. Williams, who has bestowed great attention on this point, has drawn up a table of different epidemics which have prevailed from 1763 to 1834; and adds, that "the conclusion which inevitably follows is, that the chances of recovery are diminished by the practice of bleeding in the ratio of nearly four to one, as compared with the chances, supposing the patient not to have been bled." From the experience of this disease which we have had, we coincide with Dr. Tweedie in the statement, that he has "seldom had occasion to bleed from the arm unless in particular instances of unusual febrile (or, rather cerebral) excitement, or when some organ was threatened with inflammation. We generally prefer the free topical abstraction of blood by cupping behind the neck, which is the most effectual mode of relieving the inflammation of the throat, or by the application of leeches under the lower jaw, or behind the ears." Some prefer the local abstraction of blood by means of scarification of the tonsils: but this is attended with considerable difficulty in children, timid persons, and where the cervical glands are swollen. It may be stated, then, as a safe rule, that in a particular epidemic, or in some cases, bleeding may be required; but that in general the state of the circulation will not bear bleeding; so that the lancet must be employed with the greatest caution, and only upon urgent occasions.

Emetics have been recommended by the best writers on this subject. Dr. Withering employed them throughout the primary fever and eruptive stage, but it was particularly "at the very first attack, and when the throat was more affected; when the tumefaction of the fauces was such that the patients could not swallow, but with the utmost difficulty," that their good effects were most conspicuous. Dr. Willan also employed emetics, but did not find it necessary to repeat them so often as Dr. Withering advises. Dr. Burns, who had large experience in the school at Ackworth, gave an emetic in almost every case. They are perhaps best employed at the beginning of the attack, when the tongue is coated; when there is nausea and irritability of stomach; when the tonsils are much swollen, and after local depletion. They are observed to be more efficacious in children than adults.

In the last century there appears to have been as much difference of opinion on the propriety of employing purgatives as of the lancet. Dr. Willan says, "Purgatives have nearly the same debilitating effects as blood-letting; they are indeed very seldom necessary. Nevertheless, he thinks the occasional stimulus of a small dose, as two or three grains of calomel, very useful." Since the profession has tested the importance and practical value of the observations of Dr. Hamilton and Mr. Abernethy, there are few practitioners who do not employ purgatives in scarlatina, or any other fever, unless they are contra-indicated. There is certainly no class of remedies which is entitled to more confidence than purgatives when administered with discretion in the early stages of scarlatina. Calomel, in combination with jalap or rhubarb, given at night, and a draught of infusion of roses with manna and sulphate of magnesia in the morning, will generally be sufficient. Should the mucous membrane of the bowels show signs of irritation by frequent stools of an unhealthy character, purgatives must be withheld and alterative doses of hydrargyrum cum cretâ with castor oil prescribed in their place. In such cases it may be necessary to apply a few leeches or a blister to the abdomen, and to restrict the patient to a spare farinaceous diet.

If the patient be much distressd by the excessive heat of skin during the continuance of the efflorescence, he will derive not only great comfort but advantage from the effusion of cold water over the body, as recommended by the late Dr. Currie, (*Med. Rep.*,) or by simply sponging the body with cold water. The former of these methods of allaying the excessive heat is a powerful remedy, either for good or evil; but in consequence of its having been inconsistently employed and followed by fatal consequences, it has now fallen into comparative disuse. All physicians, who have employed the latter plan of allaying the distressing heat, are unanimous in their opinion of the good effects resulting from sponging with cold water, which not only abates the heat, but diminishes the frequency of the pulse, allays the thirst, acts as a sedative, often inducing sleep and gentle perspiration.

Although no positive benefits are derived from the employment of gargles, still they are sometimes useful in detaching viscid mucus, which adheres about the fauces, and in other cases they lubricate those parts when there is a deficiency of moisture. Should the effort of gargling fatigue or distress the patient, it may be omitted. The effervescing saline draught in such cases often refreshes and at the same time cleanses the fauces. Dr. Willan, and many practitioners since his time, have advocated the internal use of chlorine in scarlatina: of this remedy the saturated solution of chlorine, recently prepared according to the directions of the Dublin Pharmacopœia, which contains about twice its volume of chlorine, is the best preparation. A fluid drachm and a half, with eight ounces of distilled water, and two drachms of syrup of lemons, may be taken in divided

portions during the day. For children, ten or twelve drops every six or eight hours are a sufficient dose. Of this remedy we have no experience; and those who have employed it have not pointed out the particular circumstances when it may be given with most advantage.

When visceral inflammation ensues in the progress of scarlatina, vigorous measures should immediately be adopted, although great discrimination is required in judging how far the antiphlogistic treatment may safely be pursued.

When the fever has subsided and the cutaneous efflorescence disappeared, it is often necessary to allow a more nutritious diet, and to prescribe tonics. Of these, perhaps the preparations of cinchona are the best; and they may be advantageously combined with mineral acids. Wine is seldom necessary in scarlatina anginosa, unless the disease be protracted and the powers lowered by large collections of matter.

3. The *scarlatina maligna*, although it commences with local symptoms very similar to the preceding variety, quickly indicates its formidable nature by the sudden depression of the vital powers. If blood-letting from the arm be a remedy of doubtful propriety in the two former varieties, it is here hazardous in the extreme. At the very onset of the disease the condition of the throat, or fierce delirium, may require the application of a few leeches beneath the jaw, or the abstraction of a few ounces of blood by cupping from the back of the neck: but the local inflammation rapidly assumes a malignant form, and typhoid symptoms set in, so that these remedies must soon be exchanged for a stimulant plan of treatment. As the heat of skin is rarely excessive, and the rash very prone to disappear, the cold affusion is to be abstained from, and there is scarcely necessity for the cold sponging; even purgatives must be administered with great caution, and mercurials given only to the extent of regulating the biliary secretions.

Dr. Bateman was of opinion that, "on the whole, the practice of administering gentle emetics appeared to be beneficial in this variety, especially at the very onset of the disease." In this opinion Dr. Tweedie coincides, adding, "unless the powers be so feeble as to render the shock of an emetic hazardous, benefit is often derived from their employment." As the case progresses, the extreme debility increases; and the malignant character of the disease is so apparent, that all the efforts of the practitioner are directed to support the patient's strength by invigorating diet, wine, cordials, tonics, and mineral acids. Perhaps of all the tonics the quinine, in solution with diluted sulphuric acid, is the most desirable. The preparations of cinchona have long enjoyed great celebrity for their remedial effects in scarlatina. The use of bark was particularly recommended by De Haen, Sauvages, Plenciz, Wall, Johnston, Huxham, Cullen, and Percival, some of whom even

regarded it as a specific cure for scarlatina. Dr. WITHERING, on the other hand, was of opinion that cinchona was often improperly administered in scarlatina. Dr. WILLAN says, (*Op. cit.*, p. 375,) "although the bark may be in many cases useful, it often disappoints our expectations; and when the disease has been improperly managed in the beginning, it is wholly inefficacious."

When the sulphate of quinine is employed in scarlatina maligna it should be given in full doses, at intervals of four or six hours; and if it does not disturb the stomach, may be persevered in as long as the typhoid symptoms continue. Where the quinine disagrees, or there is great aversion to its flavour, port wine, diluted with water, or sago, or beef-tea, may be substituted in small quantities at frequent intervals, with nearly equal good effects. If the pulse continue frequent and feeble, the presence of delirium should not prevent the exhibition of tonics and stimulants. The carbonate of ammonia, once highly extolled as a remedy in scarlatina, is often prescribed by practitioners of the present day. Various gargles have been recommended by different authors, and are more useful than in those forms in which there is great internal swelling. Bitter infusions, as of cinchona, cusparia, or contrayerva, or infusion of roses, acidulated with the diluted sulphuric or hydrochloric acids, are those most frequently employed: an infusion of capsicum is sometimes useful.

When local inflammations arise in the course of scarlatina maligna, general bleeding is rarely admissible; the practitioner must rely upon the topical abstraction of blood by cupping or by the application of leeches. Blisters have been much employed with the view of relieving the destructive inflammation of the throat, but their effects are questionable. WILLAN says, they are seldom useful, and sometimes prove injurious. As a general rule blisters are better omitted, though they may be useful in particular cases.

The treatment of the anasarca which ensues after scarlatina, is next to be considered. It might be expected that these serous effusions, which are often the symptoms of constitutional weakness, and which follow a disease characterized by great depression of strength, would require a stimulating plan of treatment to remove them. Experience and examination of fatal cases have proved, that these dropsies ought to be treated by antiphlogistic remedies. If these cases are treated judiciously before the amount of serous effusion is considerable, they are speedily relieved. In all the instances which have fallen under our notice, there has been manifest excitement of the system, indicated by increased frequency and hardness of the pulse. In many, where the state of the pulse did not require immediate abstraction of blood, repeated doses of calomel, followed by some purgative, which excites copious secretions from the intestines, have entirely carried off the dropsical effusion. In others the activity of the circulation, the hardness of the pulse,

the heat of the skin, oppression of breathing, and scanty urine, have suggested the necessity of blood-letting, followed by the administration of purgatives and diuretics. When there is suspicion of the dropsy depending on renal disease, it is prudent, in addition to the other measures, to abstract blood by cupping the loins. Of all the diuretics we prefer the combinations of potash with vegetable acids, and with these digitalis may often be combined with advantage. In children the bitartrate of potash, made into a confection with syrup and a few grains of ginger, is a useful remedy in doses of ʒss to ʒj. In some instances where the dropsy comes on in debilitated constitutions, or in scrofulous habits, blood-letting may be dispensed with; and indeed it may be necessary to combine some tonic with the purgatives or diuretics. In children the ferri potassio tartras may be added to the cream of tartar confection with advantage. To the general employment of tonics in this affection, on the supposition that the dropsy depends upon debility, we must strongly object, inasmuch as it is contrary to our own experience, and that of the best practical physicians of the present day. When the effusions are removed, and all farther danger of inflammation of the serous membranes is over, small doses of quinine or salicine, which is said by Dr. Williams to be an excellent tonic and diuretic, may be given three times a day. These remedies, with a nutritious diet, attention to the bowels, and a change of air from town to the open country or seaside, are the best means of removing all the consequences of scarlatina, and of invigorating the general health. [Bloodletting, either general or local, the writer suspects is but rarely needed in the treatment of scarlatinal dropsy, which he thinks is generally asthenic. In large children and adults, cupping over the loins is sometimes of service, but in young children antimonial diaphoretics, and the warm bath will in most instances effect a cure. Dr. Golding Bird says, that he has never known dropsy to follow scarlatina, where warm baths had been employed as soon as desquamation commenced. A mild mercurial—the hydrargyrum cum cretâ—may sometimes be advantageously given. Flannel clothing will be found an excellent adjuvant in the treatment. A large bran, linseed meal, or mush poultice over the loins will often afford great relief. Dr. Bird recommends a hot mustard poultice to the loins. The iodide of potassium, in bitter infusion, is frequently of great utility after the skin begins to act. The anemiated condition so general after the disappearance of the dropsy, may be relieved by the administration of the tartrate or citrate of iron.]

IX. PROPHYLAXIS.

There is no precaution that will prevent the spread of the miasmata from the sick person, and consequently the infection of

children and other persons if they remain exposed to the disease. The facts which demonstrate the distance to which the miasmata extend around the patient's person and communicate the disease, are still wanting; many recorded statements show, that when this disease has once appeared in schools, or other establishments for children, no precautions have been sufficient to control the spread of the infection. It is proper, however, to notice the supposed powers of belladonna in preventing the spread of scarlatina. HAHNEMANN of Leipsic, who was the first to advance this doctrine in 1807, observed that belladonna, given in small repeated doses, produced heat and dryness of the throat, swelling of the submaxillary glands, and a cutaneous efflorescence or erythema. He thence inferred that this medicine, from its producing symptoms analogous to those of scarlatina, might prove a preventive against its infection. Observations on this interesting prophylactic measure have subsequently been made by Dr. BERNDT of Castrin, by Dr. DUSTERBERG of Warberg, Dr. BEKR of Bernberg, by Professor KOREFF, HUFELAND, and KEINZMAN of Berlin, and they all give testimony, more or less strong, as to the efficacy of this narcotic employed for the purposes suggested by HAHNEMANN. The quantity administered is very minute. Three grains of the extract of belladonna are to be dissolved in f℥j of distilled water; of this solution three drops are to be given twice a day to a child under twelve months old, and one drop more for every year above that age. In general no sensible effects are produced by these doses, but in some instances it brings out an eruption similar to scarlatina. As we have never employed belladonna as a prophylactic against scarlatina, we can offer no opinion as to its value; but we have seen pain and redness of the fauces, with an efflorescence on the skin of the throat, follow the administration of a sixth of a grain three times a day. This subject is certainly worthy of the careful examination of those practitioners who have the charge of establishments for children, where scarlatina has made its appearance. It would not induce the prudent practitioner to relax in other preventive measures, such as complete insulation of the affected, ventilation, cleanliness, [the free use of the chlorides,] &c.; but as such measures have hitherto generally failed in the desired object, there can be no objection to making an experiment which, as far as we at present know, is perfectly harmless. More minute details on this subject may be found in *Cyc. of Prac. Med.*, art. SCARLATINA; *Arch. Gén. de Méd.*, Juin, 1824; HUFELAND's *Journ. du Prac. Heilkunde*, Nov. 1825; RUST, *Magazin fur die gesammte Heilkunde*, v. xxii. 1, 182.

CHAPTER XIII.

PUERPERAL FEVERS.

On perusing the numerous treatises that have been published within the last half century on this highly important class of diseases, the reader must necessarily be struck with the very extraordinary differences of opinion amongst the several writers as to the history and nature of the disease, the symptoms, mode of treatment, and the result of the practice adopted. The only point on which all seem to be agreed is, its great and striking fatality, and that it is one of the most serious, intractable, and destructive maladies to which puerperal women are liable.

What is of practical importance in these different histories may be easily reconciled, without attributing to any of these authors erroneous statements or wilful perversion. They have each described what they saw, fairly and completely, and the same difference of opinion as to the nature of the disease exists to the present day. The confusion has arisen chiefly from considering that every form of fever to which puerperal women are liable is necessarily the same, the truth being that they vary in their nature and treatment as much as other kinds of fevers. With this precautionary consideration there can be no reasonable objection to the term "*puerperal fevers*," which has so often been caviled at and attempted to be reformed. All the other names which have been substituted are liable to objection, as assuming some particular structure to be invariably attacked with disease, whereas the local affection is by no means uniform; and hence the term "puerperal peritonitis," "peritoneal fever," "inflammation of the uterus and its appendages in puerperal women," will be apt to mislead. The name "*puerperal fevers*" compromises no opinion; it does not necessarily imply the existence of idiopathic puerperal fever, a doctrine now so much disputed; and whatever may be our own view of the subject, we beg distinctly to state, that in selecting this name we only wish to use one most easily understood and generally recognized.

From our own researches into the writings of others, and from personal experience, both in private practice and as attached for nearly eighteen years to a very large lying-in hospital, we are inclined to doubt the propriety of considering puerperal fever as merely symptomatic of *local inflammation*. But if this were admitted, we have records of so great a variety in the seat of the

inflammatory action, as proved upon dissection, that it will be found impossible to select any one part as peculiarly affected. We find in other fevers a liability to particular local lesions, equally varying: the brain, the chest, the mucous membrane of the stomach and bowels, have been, in different epidemics, the seats of the disorganizing process; but it has been too much the fashion to put down all the morbid appearances as exclusively the cause, and not the result, of the constitutional affection. In considering puerperal fevers it has long been our conviction, that what has been called by SYDENHAM *the constitution of the year*, has been too much lost sight of. The great difference in the accounts of puerperal fevers by different writers is thus easily explained:—They have seen and described epidemics differing in their type, their local accompaniments, and their power of being influenced by remedies; and hence, honestly stating exactly what they saw, we have an explanation of what would otherwise appear contradictory. That the fevers of puerperal women are much influenced by the character of the other fevers of the season, was strikingly exemplified in the Westminister Lying-in Hospital during the spring of 1838, when some of the fatal cases were attended by petechial eruptions precisely similar to the *spotted* fever, which was so prevalent at that time in the London hospitals.

In the spring of 1822 puerperal fever existed in the Lying-in Hospital in two very different and well-marked forms, at an interval of about six weeks between the last case of the first epidemic and the first case of the second. The early cases were of an active inflammatory character; the peritoneal covering of the uterus and intestines was chiefly affected; the albuminous and serous effusions in the fatal cases showed a sthenic state of the system: that is, the cerum was clear, the coagulable lymph firm and white; the patients bore blood-letting and other active treatment to a great extent fairly, and with much advantage; the blood drawn was strongly cupped and highly buffed, and the fatal cases were few. Six weeks afterwards a very different epidemic was found to exist. The same remedies which had been so beneficial a few weeks before were naturally at first tried, but their bad success confirmed the sagacious remark of GOOCH, that "the effects of remedies form not only an essential but the most important part of the history." (GOOCH *on Peritoneal Fevers*, p. 35.) The fever was attended with marked oppression and debility; the local pain was comparatively slight; the pulse was extremely rapid from the first, with no force, and easily compressible; in many of the cases purulent deposits took place in the joints and in the calves of the legs, and in one case there was destructive inflammation of the eye. On dissection, a quantity of fetid, dark, turbid serum, with loose and soft shreds of dirty lymph, was found in the peritoneal cavity, with a large collection of highly offensive gas. In some the substance of the uterus and ovaries was infiltrated with pus, especially in those

cases where there had been purulent deposits in the limbs. It was shortly after these cases occurred, that attention was directed by Dr. Marshall Hall to some similar cases of purulent deposit and destruction of the eye after parturition, (*Med. Chir. Trans.*, vol. xiii. part 1,) and which were the first series of cases published in this country of that nature, although some isolated cases had been previously noticed, which had been looked on as accidental complications. In these two epidemics, so striking a variety of character could not fail to attract attention, and we shall shortly have occasion to notice others; and yet Dr. Armstrong quotes with approbation the following sentence from Dr. Hulme :—"The operations of nature upon the human frame in this disease are the same in Britain as in Greece, and continue the same at this day as they were above two thousand years ago. This is likewise a clear proof of the IMMUTABILITY of puerperal fever." (Armstrong, p. 63.) In our opinion the puerperal fevers vary, as other fevers do, according to the season, local symptoms, the effects of remedies, and in the organs affected. We shall not trace the history of the numerous epidemics which have been recorded; but referring those who are desirous of acquiring such information to the more extended publications on puerperal fever, proceed to give a plain and practical account of those forms of the disease which are met with in hospitals and private practice, cautioning young practitioners to reflect, that as these epidemics have already so much varied, new varieties may again be found; and that it is advisable, especially for those who have the charge of lying-in hospitals, to watch closely and anxiously the first cases of the season, both as to the symptoms, and as to the effects of remedies, before deciding on the character of the disease. A minute and searching investigation into the morbid appearances of the fatal cases is no less necessary, for there is fair reason to suppose, since the publication of the cases of inflammation of the veins, absorbents, and muscular structure of the uterus, by Dr. Robert Lee and others, that formerly those peculiar affections may have existed and yet escaped observation. It is to Dr. Robert Lee that the profession in this country is principally indebted for a much more extensive and complete investigation into the morbid changes produced in the course of this disease. But though agreeing with him to a certain point, and not doubting that in many, perhaps most of the cases formerly known as the low or malignant form of puerperal fever, the fatal symptoms have arisen from disorganizing inflammation of the deeper seated tissues of the uterus or its appendages, or from phlebitis, these changes having been overlooked in dissection; yet Dr. Lee has in our judgment made a material omission, and one very common at the present day, in passing over the influence of the nervous system in these cases; the vascular system is held to be all in all, everything is inflammation, and the powerful effect of altered nervous energy in the production of disease is

lost sight of. Even the congestive form of fever, as described by Dr. ARMSTRONG, and which every one of any extended experience must recognize, is but slightly alluded to, and, as it appears to us, is not cordially allowed to exist. In GOOCH's treatise on peritoneal fevers already quoted, several cases are recorded in which death ensued after certain symptoms, and in which no morbid appearances were discovered on dissection. Dr. LEE would reply to this, that the examination was not pushed far enough, and that a more close inspection must have discovered some of the changes he has described. But after Dr. LEE's researches into these subjects were known, several cases similar to those related by GOOCH, occurring in our own practice, and in that of others, convinced us that in these something might therefore be found: the most careful search was made for morbid alterations of structure in the veins, the absorbents, the muscular structure, and the lining membrane of the uterus and of the adjacent parts, and nothing could be found to explain the cause of death. What Dr. MARSHALL HALL has denominated the "*shock*" on the nervous system, has been much overlooked, which, whilst in itself now and then the immediate cause of death, is much more frequently followed by great depression of the nervous system, and ultimately by disease of a more protracted and generally fatal character. This condition is familiar to surgeons after severe injuries from accident, or after operations, and it is well known that patients in the crowded wards of hospitals, or such as have previously led dissipated lives, are much the most seriously and rapidly affected.

One of the most interesting portions of Dr. FERGUSON's recent work, (*On Puerperal Fever*,) is that detailing his own views of the cause of puerperal fever. By a series of arguments, ingeniously arranged and cleverly narrated, he endeavours to establish the following propositions:—1. The phenomena of puerperal fever originate in a vitiation of the fluids. 2. The causes which are capable of vitiating the fluids, are particularly rife after childbirth. 3. The various forms of puerperal fever depend on this one cause, and may be readily deduced from it. He proceeds to show, by enumerating various experiments, that the introduction of pus, putrid matter and other vitiated substances into the veins, produces lesions of various organs, more or less similar to those found in the fatal cases of puerperal fever, and a train of symptoms closely analogous. He then points out the condition of the uterus after delivery, and the separation of the placenta; the bruised condition of the pelvic cavity; the abraded state of the mucous membrane of the uterus, where the placenta was attached; the gaping orifices of the veins and sinuses; the offensive lochial discharges; and the injurious effects of mechanical injury, retention of coagula, or of portions of placenta, or of dead and putrid children. All or any of these conditions he considers as ready sources from which vitiated matters can be ab-

sorbed into the circulation. So far we think he has most ingeniously proved his positions.

All the difficulties, however, in our opinion, are not yet removed. Dr. Ferguson takes pains to combat the opinion of Ritgen, that puerperal fever arises from something like a metastasis of the blood destined for lactification from the mammæ to the peritoneum and uterus, by noticing that the condition exists in all women at a certain time after delivery, whereas only a few are attacked with puerperal fever, (*loc. cit.*, p. 100.) The same argument, however, weakens his own propositions; for it must be acknowledged that numbers of cases occur, where there have been retained coagula or portions of placenta in a putrid state, or dead, and decomposed children, or injuries from the use of instruments, and yet such patients have recovered without any untoward symptoms. These are the extraordinary events; but the existence of offensive lochial discharges, and of the alterations in the mucous surface of the uterus, are to be found in all cases of ordinary parturition. We can also state from our own experience, that the most serious and fatal forms of puerperal fever are generally those cases where the symptoms begin the earliest after parturition, sometimes in a few hours, and before pus could have been formed, or decomposition have taken place. It is a well-known and curious fact, that the severe symptoms which often follow wounds from dissection, by no means seem to have their intensity proportioned to the degree of putrefaction of the matter inoculated, but often the absorption from the freshest bodies is the most pernicious in its effects. Duhamel has related an instance, in which an innkeeper and a butcher died from receiving accidental wounds in slaughtering an ox which had been over-driven; and the blood from the same animal produced gangrenous inflammation on the hand and cheek of two women who were sprinkled with it. During the progress of puerperal fever, in the same patient we often find, in the first instance, active inflammation with highly fibrinized blood; in its course, as typhoid symptoms appear, the condition of the blood is completely changed, while subsequently, in convalescence, its natural character becomes gradually restored. Dr. Tweedie, in his able article on fever, (*Cyc. Prac. Med.*,) has cited cases by Drs. Stevens and Potter, in which, during an epidemic fever, the blood drawn from healthy persons in the infected localities, was found to possess the same morbid character with that drawn from those actually sick, "and could not be distinguished from the blood of those who laboured under the most intense forms of the disease," while blood drawn at the same season from persons living in the surrounding healthy districts was totally different. The paper of Mr. Gulliver (*Trans. Roy. Soc.*) has been quoted by Dr. Ferguson in confirmation of his views, but with doubtful advantage. There is a wide distinction between the defibrinated blood in typhus and other malignant fevers, and the mere presence of pus

in the circulating fluid. Mr. GULLIVER found pus in the veins in one case of puerperal fever only; but he found it also in cases of confluent small-pox, swelled leg from ulcer, superficial wound of the tibia, erysipelas, suppuration of the integuments of the thigh, and in tubercular phthisis. In the latter class of diseases, as well as in lumbar or other extensive abscesses, the existence of pus in the veins has been long known, and has been supposed to be the cause of the hectic fever accompanying such diseases. But where it can exist with such very different symptoms, from such a diversity of causes, and under such a variety of circumstances, it is assuming too much when it is stated to be the cause of puerperal fever. In the experiments upon animals referred to by Dr. FERGUSON, allowance ought to be made for the sudden, and what may be called violent, mode in which the offending matter has been introduced into the circulation, and so different from what takes place in spontaneous absorption. It must not be forgotten that the most innocent substances, when thus injected into the veins, cause death rapidly, and with as much disturbance as the putrilage and fetid pus used in CRUVEILHIER'S and GASPARD'S experiments. In MAGENDIE'S *Lectures on the Blood*, this fact is proved distinctly, and very much alters the force of Dr. FERGUSON'S arguments. Neither were the effects of the injection of pus, or of putrid blood, or of beef gravy, by any means uniform, either in degree, in the extent of injury, or in the organs injured. It is remarkable that in GASPARD'S eighth experiment, where mercury was injected, the lesions so often found in puerperal fever were more especially produced in the sheep operated upon.

Dr. FERGUSON believes that the vitiation of the fluids is the essential cause of puerperal fever, and that the condition of the atmosphere, and the sthenic or asthenic state of the patient, only modify the type of the fever, as much as those circumstances are known to modify small-pox or measles. Time and more extended observation will test the value of this theory; but we are by no means disposed to lose sight of the influence of some preliminary effect on the nervous system, some previous step by which these changes in the condition of the blood take place. In the cold stage of cholera, in the onset of yellow fever, in ordinary typhus of the malignant type, where there has been no source from which either purulent or putrid matters could be absorbed, we find a remarkable condition of the blood, its cohesive property appearing to be changed and even destroyed. MAGENDIE'S researches and experiments tend to prove that the most striking effects from the injection of pus, serum, or other matters into the veins, are shown in the first instance by destroying the coagulability of the blood and altering its colour. He also states that healthy pus rarely produces this effect, although serum, or pus mixed with serum, does so at once. To this want of cohesion in its particles and alteration in quality, MAGENDIE attributes the lesions of the important organs

through which it is distributed, and the serous infiltrations that subsequently take place. These same conditions are produced in those formidable fevers and other diseases, in which one of the earliest and most striking changes is in the character of the blood, and yet without the possibility, in the first instance, of the absorption of pus, serum, or any other vitiated matter into the system. The miasmata from foul sources, whether vegetable, animal, marshy or atmospheric, are supposed to be the exciting causes in these diseases, and, as shown by the symptoms, acting primarily on the nervous system. That the nervous system is the main instrument by which this change in the blood takes place, is partly proved by the fact that electricity in a powerful form, and many of the animal and vegetable poisons which act solely on that system, produce the same phenomena, viz., blood divested of its coagulating or vital property. The effect of atmosphere, noxious exhalations, hospital atmosphere, and season, on the type of the prevailing puerperal fever, is distinctly proved; and we think the fair consideration of all these circumstances leads to the conclusion, that the vitiated state of the blood is the secondary and not the primary link in the chain of phenomena, and that it occurs in many instances in diseases of similar character to puerperal fever, where it could not arise from venous absorption. Andral has truly and sagaciously remarked, that no line of demarkation can properly be drawn between the blood and the solids, and that, physiologically speaking, it is impossible to conceive that one of these two parts of the same whole could be modified without the other being so likewise. There is no longer any meaning, he observes, in the disputes between the Solidists and the Humoralists; the system appears to constitute but one great whole, indivisible in the state of health, as well as in that of disease. The division is a distinction of small importance, and one that is not always just, since it ceases to exist in the intimate structure of the organs in which all the grand vital phenomena take place, and in which also occur all the changes that constitute the morbid state.

On a knowledge of the *predisposing causes* will depend much, if not all, that we can do, to guard the patient from this formidable malady. These are, principally, mental depression and agitation, exposure to cold, retention of coagula and portions of the placenta, mechanical injuries during parturition from manual or instrumental aid, crowded and ill-ventilated rooms, noxious exhalations, fatiguing attempts to suckle, &c. The question of propagation of puerperal fever by contagion is a most important one, and we could enumerate many striking facts proving its occasionally contagious nature. It does not seem to us at all to militate against this conclusion, that it very often is not contagious, because we find the same exemption in other universally acknowledged contagious diseases, common typhus, and scarlet fever, hooping-cough, small-pox, measles, &c. Few who have seen much of the disease will doubt its occasionally,

at least, being conveyed through third persons, usually the medical practitioner or the nurse, and therefore it is our duty to take all reasonable precautions in visiting healthy parturient women upon leaving those who are labouring under the disease.

A. ACUTE PUERPERAL PERITONITIS.

I. SYMPTOMS.

The simplest form of puerperal fever is that of peritonitis. On the second, third, or fourth day after delivery, in some instances much later, the patient is seized with a severe rigour, accompanied or speedily followed by acute pain in the abdomen, generally in the hypogastric region. The pain is constant, though there are often exacerbations at irregular intervals; it is increased by pressure; and the tenderness, which is speedily followed by fullness and tension, rapidly extends over the whole of the abdomen, often to the pit of the stomach. The patient lies on her back, the pain being aggravated by turning to the side: the extremities are generally slightly drawn up, to relax the abdominal muscles, and to avoid the pressure of the bed-clothes. The local symptoms are always accompanied with well-marked constitutional disturbance; the secretions, more especially the milk and lochial discharges, are checked; the skin becomes hot, the pulse rapid, small, and wiry, or sometimes full and bounding. The tongue is sometimes creamy and moist, often dry in the centre, with a dirty coat; now and then it is scarcely affected. There are sometimes, but not constantly, great pain of the head with throbbing of the temples, want of sleep and restlessness, with occasional vomiting. The countenance is anxious, often suffused. The respiration is hurried, whilst the slight disturbance or bodily exertion increases the abdominal pain. If the proper remedies be promptly employed, and the disease yield to them, the pain gradually abates, the tenderness not so soon, the skin becomes moist, the pulse subsides, the milk and lochial discharge become more abundant, and the patient begins to change her posture from the back to the side. All these are promising signs of recovery, and unless there should be a relapse, by no means an uncommon event, she is well again in two or three days. In other instances, however, the result is different. The pain and tension of the abdomen increase, and often sudden or nearly sudden subsidence of the pain after some hours takes place; the abdomen feels hard and tympanitic; the pulse becomes more and more rapid, as well as feeble and thready; the skin clammy and cold; there is occasional confusion of ideas, which is soon followed by low muttering delirium; the tongue becomes dry and brown, the teeth covered with sordes; the patient is distressed with eructation or with vomiting, sometimes of dark or green matter: hiccough, twitching of the limbs, sunk and cadave-

rous countenance, and cold extremities, are the sure indications of approaching death. Though this is the common course of the disease when fatal, the symptoms do not always assume this exact form, but what is termed a latent character. There is often no confusion of intellect to the last; the situation of the pain varies, or it may be entirely absent. Some years ago we assisted at the examination of a patient in the British Lying-in Hospital, who had constant sickness but no abdominal pain, except at the pit of the stomach, and no tenderness on pressure; and yet the appearances proved that extensive and violent peritoneal inflammation had existed.

This form of puerperal fever is often epidemic; it is that which has been described by Dr. Gordon, Dr. Armstrong, Mr. Hey, and others; and although much more fatal when epidemic than when in a sporadic form, is, when taken in time, most under the control of remedies. It now and then creeps on more insidiously, is not preceded by any distinct rigor, the pains of the abdomen are more intermitting and are mistaken for after-pains, but the pulse always becomes suspiciously rapid, and whenever this is the case, immediate alarm should be taken.

II. ANATOMICAL CHARACTERS.

On dissection of cases of acute puerperal peritonitis, the following appearances are found:—The peritoneum preternaturally and uniformly red and often thickened; sometimes it is here and there pale; with effusion of serum into the abdominal cavity mixed with flakes of coagulable lymph. The intestines are distended with flatus, and matted together by patches of coagulable lymph. These appearances are more or less diffused over the fundus of the uterus, on the reflexions of the peritoneum, upon the uterine appendages, on the omentum, the liver, and other viscera, and not unfrequently over the peritoneal covering of the diaphragm. The ovaries, the uterus, and the Fallopian tubes are often coated with a creamy fluid, and sometimes purulent deposits are found in the muscular structure of the uterus and in the ovaries, the natural structure of the latter being often completely disorganized and converted into sacs of purulent matter.

III. TREATMENT.

The treatment, to be successful, must be early and prompt; every hour of delay after the onset of the symptoms is of the utmost importance. The medical attendant is rarely summoned until the rigor has ceased, and the pyrexia is established. If the patient is seen sufficiently early during the rigor, hot diluents and perhaps an emetic should be given; and hot fomentations or poultices

should be freely applied over the abdomen. A full dose of calomel with James's powder and opium may be administered, and in a couple of hours a purgative of castor oil, salts and senna, or jalap. Warm water injections may be thrown up the rectum, and also the vagina.—We have often found these remedies, when used at once, sufficient to arrest the disease. In 1822, when the writer was house-surgeon at the Lying-in Hospital, where an epidemic puerperal peritonitis was very prevalent both among the in and out patients, several cases were arrested, apparently *in limine*, by this treatment. If, however, we find the pulse increasing, and the symptoms not alleviated; or if, as is most likely, we do not see the patient till after the rigor has subsided, and the disease is established, it will be necessary to bleed. Should the patient be feeble and delicate, and the symptoms not severe, or the pulse much accelerated, we may perhaps be satisfied with the application of leeches to the abdomen; but they are in general much better kept in reserve for future purposes: we must regulate the mode of abstracting blood, as well as the quantity, by the strength of the patient and the effect produced. The object being in nearly all cases to produce the greatest possible effect with the least loss of power, the best plan is to bleed in the erect posture and from a large orifice. The quantity taken must of course depend upon circumstances: we have been most satisfied when decided faintness has been produced; if, however, upon recovery from deliquium, the pulse be still hard and quick, and the pain not decidedly relieved, it will be prudent to continue the flow of blood till those objects have been attained. The patient should be visited within six hours, and if there be recurrence of the pain, and if the pulse again become hard and quick, more blood must be taken. This second bleeding may perhaps be followed by a third, according to circumstances; but symptoms of debility are apt so soon to show themselves, that subsequent bleedings are often better when only local, by means of leeches, the number being applied proportionate to the degree of pain and tenderness. The pulse is the best guide, for the pain, after the first full relief from the bleeding, is often of a mixed character, partly inflammatory and partly nervous—to be detected only by watching closely the other symptoms. The tenderness is a less certain guide, for few will bear pressure for a considerable time after the inflammatory symptoms have been entirely relieved. Many patients also from fear shrink from the pressure of the hand, although, by drawing off the attention, it will be found that they bear firm and steady pressure very well. As a most valuable adjunct to the abstraction of blood, mercury must be freely given. In the cases now under consideration, after having tried almost every form and every dose, we give the preference to calomel, in moderate doses at short intervals. After the bowels have been freely emptied, we generally order five grains of calomel every two, three, or four hours, according to circum-

stances: it is decidedly more efficacious when combined with Dover's powder, or with James's powder and opium. Many object to opium in these cases—that it masks the disease; but when thus combined, we deem it to have a material influence in allaying the symptoms, and preventing the confusion often arising from the mixed nervous inflammatory or even spasmodic pain, which for the first two or three days after labour is so apt to exist. Hot poultices or fomentations to the abdomen are to be frequently applied—a hot light linseed meal poultice is on the whole most convenient and most easily borne, and should be changed as often as it gets cool. In the majority of cases, if no marked relief has been obtained before, the symptoms yield when the mercury begins to affect the mouth, the signs of recovery mentioned before taking place. In less favourable cases, when, in spite of remedies, the disease advances, much good may be gained by the application of hot turpentine to the surface of the abdomen, or a large blister may be applied, and the sore dressed with mercurial ointment. We have witnessed in some cases the most striking advantage from this remedy, even when every sign of effusion had taken place. When there is great distension of the abdomen, with eructations, sickness, and the pulse varying from 130 to 160, remission of the pain, and a clammy cold skin, even then we need not despair. Nourishment and stimulants, wine, brandy, and ammonia, should be freely administered. In such cases the internal exhibition of the turpentine has now and then succeeded, though no practitioner who has made trial of this remedy has found it so successful as Dr. Brenan, of Dublin, has stated it to have been in his own practice. But as a forlorn hope, after effusion had taken place, we have known it often tried, and in two cases with success. In some others the effect of the first dose was so decisive in carrying off flatulence, and allaying the tympanitic swelling, that we have been much disappointed to find the rapid return of all the mischief. Dr. Joseph Clarke found it equally tantalizing, and very difficult to get the patients to continue the doses after the first had produced relief. (See his letter in *Appendix*, No. II., cited by Armstrong.) In the progress of the alarming symptoms of collapse, the only hope is in the constant watchfulness of the attendant; and as we have known a few cases recover when everything seemed desperate, we feel inclined to urge the most devoted application of all the usual restoratives to the last. Some years ago we left a patient at the Lying-in Hospital so far gone, that it was predicted she could not live through the night; she was alive and improved the next morning; the house-surgeon had never left her, had supplied her with brandy and egg at short intervals by teaspoonfuls, and in a fortnight she left the hospital quite convalescent. Such is the treatment we should recommend in this form of puerperal fever. The minute details must depend on the circumstances of each case. It is impossible to do more for the young practitioner than to give

him the outline, and it is only by his personal experience that he can gain the art of weighing the comparative importance of symptoms, and the most ready means of meeting them.

B. THE ADYNAMIC, OR MALIGNANT PUERPERAL FEVER.

I. SYMPTOMS.

There is another form of puerperal fever, however, of a much more dangerous and fatal description. The symptoms differ in some respects from the acute peritoneal inflammation just described, and in many of the cases the morbid appearances found upon dissection are essentially different. It would be satisfactory if we could always trace the connection between the peculiarity of the symptoms and the morbid changes, as it would simplify our knowledge of the subject, and in time improve the treatment. Dr. Robert Lee has attempted this, but we are obliged to confess that our experience by no means confirms the accuracy of his descriptions. In the low or malignant forms of puerperal fever, we have certainly met with the appearances on dissection which he has well described, but we have often met with the same character of symptoms equally fatal in their course, but have not been able to discover the morbid appearances in the structure of the uterus or its appendages mentioned by him and by some French and German writers. In the epidemics which prevailed in the Dublin Lying-in Hospital, during the time that Dr. Collins was master (from 1826 to 1829), which were very fatal, though many of the cases were of this malignant character, and typhus fever with petechial eruptions was prevalent at the same time in the city, in by far the majority of the cases the deeper seated structures were but little affected. The symptoms of this form of the disease are, to a certain extent, similar to those of acute puerperal peritonitis; there is often a rigor, but by no means always well marked; the pain in the abdomen is less severe, and in some cases more circumscribed, and often limited to the hypogastrium or to the right or left iliac regions, often both sides being affected. There is less tenderness on pressure, and the pain in some instances appears deeper seated. In these cases it would be very satisfactory if we could trace a connection between the symptoms and the morbid appearances; for instance, where the seat of pain and tenderness is in the right or left groin, that the ovaries, broad ligaments, and Fallopian tubes are, in the first instance at least, the seat of inflammatory action; and where the hypogastrium is principally attacked with deep-seated pain and tenderness, that the uterine structure is affected. The appearances found in two fatal cases which occurred in the General Lying-in Hospital, in the early part of 1838, will prove the fallacy of this conclusion. In the first, the symptoms came on the third day after delivery, and the patient

survived three days only. On dissection the following were the appearances—general peritoneal inflammation; disorganization of both ovaries, particularly the left; and a collection of purulent matter in the folds of the broad ligament near its connection with the uterus. In this case the patient had no pain in any part of the abdomen, even on deep pressure. In another case the symptoms were well marked on the second day after delivery, and proved fatal within twenty-four hours. The morbid appearances noted after death were, slight effusion, not more than an ounce and a half of fluid in the abdominal cavity, complete disorganization of the ovaries, with sloughing of the lining membrane of the uterus. In this case there were pain and tenderness of the abdomen, principally referred to the *umbilical* region. Such contradictory symptoms are so common, that they cannot be fairly classed under the head of anomalies, and seem to justify the conclusion that, in the present state of our knowledge, we are not entitled to consider the changes of structure found after death as conclusively indicated by the previous character and situation of the pain.

The most formidable symptoms of this form of puerperal fever are to be found in the pulse, the countenance, and the nervous system. In all of these cases the pulse is, at a very early period, extremely small, rapid, and compressible, varying from 130 to 160; the countenance is remarkably anxious and sunk, with a livid, often a yellow tinge of the skin; there are much more restlessness and tossing than in the more active inflammatory fever, nor does alteration of the posture appear to increase the pain as much as might be expected. The muscular powers, however, are extremely prostrate; there is great mental depression, and though the intellect often remains clear to the last, in the majority of the cases there is low muttering delirium; the tongue is coated, at first with a white, and soon with a dirty yellow fur, which soon becomes dry and brown, though often in hospitals, during epidemics, the disease runs its course so rapidly, that there is no time for this last change in the appearance of the tongue. Dr. Gooch's remark as to the effects of remedies, becomes here a valuable guide. Where blood is taken from the arm, a very small quantity produces faintness, and the blood is usually dark, the coagulum formed is loose and easily broken down, and the serum is separated slowly and imperfectly. After even a very small bleeding, the patient's prostration of strength is frightful, and the urgency of the symptoms is increased. Diarrhœa is a very common attendant, the evacuations being often highly offensive, and the patient is often distressed with eructation and vomiting. The lochial discharges are fetid, but by no means always suppressed. The abdomen is very early tympanitic, but firm steady pressure more frequently relieves than aggravates the pain. The breasts speedily become flaccid from subsidence of the milk: there is an eagerness for cold drinks, or, on the other hand, for brandy or porter; but now and then an indifference to all sus-

tenance, and a dislike to be disturbed. The stage of collapse soon succeeds, and the symptoms often run their course, during hospital epidemics, with such astounding rapidity, that death may take place in a very few hours. We have long remarked, that whenever the disease begins very shortly after delivery, within the first twelve or eighteen hours for instance, the more intense and rapid is its progress and the result more constantly fatal.

II. ANATOMICAL CHARACTERS.

The anatomical characters vary in this as they do in the more active forms of puerperal fevers. Most commonly, in our experience, in the peritoneum, throughout its whole extent, the principal morbid appearances are to be found. There is a large quantity of fetid gas in the intestines and abdominal cavity. The peritoneum has a dusky hue, very unlike the bright florid appearance of the acute peritonitis. The effused fluid has a dirty, brown, often bloody appearance, and is peculiarly glutinous (mentioned also by Dr. Collins). The shreds of lymph, when there are any, are loose and destitute of firmness. In many, perhaps in the majority of these cases, the morbid changes are thus limited, and by the most careful search, none of the other textures exhibit any morbid alteration. But as in the more active inflammatory disease, lesions of other organs are often discovered, more especially the uterus and ovaries, the structure of which is broken down and pulpy, that of the uterus often approaching to gangrene. In 1829, in the Maternité at Paris, of 222 fatal cases, forty-nine exhibited this ramollissement of the uterus. In many of the worst cases in the General Lying-in Hospital, a sphacelated condition of the lining membrane of the uterus was found; and in Waldron, in the year 1836, the whole structure of the uterus was, to use the words of the house-surgeon, who recorded the case, "*fairly rotten.*" In this instance, and in some others, there was a peculiar fetor from the whole of the abdomen for two days or more before death. It is to be regretted that in by far the majority of the fatal cases in our lying-in hospital, the friends prevented post-mortem examinations.

III. NATURE.

It would seem then, from the history of many of the cases, that although the same structures are attacked in both these forms of puerperal fever, and also, although the nature of the affection is evidently inflammatory in both, the character or type of the inflammation is manifestly different. In what this difference consists appears to be the chief difficulty; and we are inclined to attribute the diversity in the character of puerperal epidemics to this differ-

ence, rather than to variety in the locality of the inflammation itself. We see very different forms of inflammatory action under other circumstances, and why not in this? We admit the scrofulous, the rheumatic, and the erysipelatous forms of inflammation to be as distinct as the dynamic and adynamic, and why may we not allow a difference in the nature of the local inflammation in puerperal fevers? The distinction appears to us to depend mainly on the energy, or want of energy, in the nervous system. In epidemics, this difference is generally remarkably shown, and the great fatality of puerperal fevers in London lying-in hospitals is evidently much influenced by the previous moral and physical condition of the patients. A great number are half-starved before admission. In reading over the recorded cases of our lying-in hospital, one of the patients on her admission is said to have devoured her food in the most ravenous manner, having evidently been deprived of wholesome food for days before. A considerable number of the women are habitual dram-drinkers, and on losing their daily stimulus, rapidly fall into a state in which disease is excited from the most trifling causes, and becomes strikingly fatal. The late respected and intelligent matron was so convinced of this being frequently a cause of puerperal disease, that she administered with the best effects gin mixed with gruel to the poverty-stricken unfortunates, when they began to show, a day or two after delivery, a peculiar prostrated look and manner with a trembling tongue, which her experience easily detected. In the spring of 1838, when puerperal fever was remarkably prevalent and more fatal than was ever before known in the lying-in hospital, it was discovered that there was an open sewer, 200 yards in length, immediately at the side of the building, which had become exceedingly foul and offensive. The hospital was closed for several weeks, but the first cases readmitted were attacked with fever, and there was no remedy but again to close the hospital and take measures to cleanse and inclose the sewer.* The suddenness and the fatality of the fever were precisely like that form of typhus fever which often arises from exposure to similar miasmata, the effect of which on the nervous system is well known.†

* The hospital was re-opened in the first week of November. From that time to the 1st of August, 1839, 142 cases were admitted: 7 or 8 cases of decided puerperal fever have occurred, and a few of abdominal pain and tenderness: all the cases recovered.

† In an early volume of the *Medical Gazette*, are recorded some striking cases of this description which occurred at Clapham, and were clearly traced to exposure to the putrid exhalations from the contents of a privy which had been emptied and discharged near the house.

IV. TREATMENT.

The treatment of this form of malignant puerperal fever has been very unsatisfactory. Dr. Gordon, Mr. Hey, and Dr. Armstrong, the advocates for large bleedings in all cases, because they happened to see epidemics which would bear it and demanded it, have said that the fatality of the *low* puerperal fever of London must have arisen from timidity, and not pushing bleeding to a sufficient extent; that however feeble and rapid the pulse, bleeding was the only remedy to be depended upon, and that the pulse would *rise* on the loss of blood. An *oppressed* pulse would certainly do so in many instances, but there is a certain and important difference between the oppressed and really feeble pulse, though many can with difficulty distinguish the one from the other. The earliest experience of the writer in puerperal fever was in two distinct and well-marked epidemics in the spring of 1822. From the decided advantage of copious bleeding in the first, we were naturally led to push what is commonly called bold practice in the first cases of the second, but the result soon proved our rash mistake. These adynamic cases will not bear bleeding favourably—a very few ounces will soon produce fainting followed by rapid collapse. It should, however, be kept in mind, that in an epidemic of this description, cases of an opposite character occasionally occur. Women of robust constitutions, previous to the attack in comfortable circumstances, and accustomed to a generous diet, may have the active form of the disease, while dozens of patients are suffering under the other form in the same wards. We must be guided, then, by the condition of the patient, as well as by the character of the prevailing epidemic. Unless the pulse be exceedingly powerless, we may try the effect of blood-letting; should the patient quickly turn faint, the best way is to close the orifice and wait patiently till the blood has had time to show its condition. If marks of active inflammation are apparent, the vein may be again unclosed, and more blood taken; and generally after the first faintness has subsided, a much larger quantity will flow than might have been expected. The pulse must be closely watched, and the arm bound up, when its feebleness shows that sufficient blood has been drawn to affect the circulation. If we are unable to take blood from the arm, we may apply leeches to the seat of the pain, from one to four or five dozen, according to the degree and extent of the pain, as well as the strength of the patient; for some it must be borne in mind, are even struck down by a few leeches. Where the pain is chiefly referred to the uterus, and particularly if that organ is felt swollen, hard, and tender; a few leeches applied to the os uteri and cervix, by means of a uterine leech-tube, will give greater relief, and with less loss of power than four times that number externally. Leeches thus applied are likely also to be most serviceable where the lochial dis-

charge is stopped. Cataplasms to the abdomen, as long as there is no tension, are sufficient; they give relief, and also promote a warm perspiration. But if there are early tympanitis and much eructation, the application of a blister, or of hot turpentine, will be found more serviceable in relieving the pain and allaying the flatulence. Though often much disappointed in the effect of mercury in this form of puerperal fever, we do not know any remedy from which manifest good has been so frequently derived. Dr. COLLINS has remarked a great difficulty in affecting the mouth with mercury in these cases, which agrees with our experience. We have seen many cases recover where the mouth has not been affected, and several die where full mercurialization had been established. But on the whole, when the constitution is shown to be under the mercurial action, the symptoms usually improve, the healthy action is slowly restored, and the pulse becomes steadier and quieter. Along with calomel, in doses of three to five grains every hour or two, we are in the habit of giving Dover's powder, or a combination of James's powder and opium, from half a grain to a grain of the latter. The larger doses of calomel have not been so successful in our practice as they appear to have been in that of others. We have given twenty-grain doses every four hours, but though in some it produced rapid salivation, and with advantage, in most of the cases it produced much distress, and failed to arrest the disease. Dr. COLLINS gave often upwards of 300 grains of calomel in the course of the treatment of a single case, and to another which recovered he administered 308 grains in twenty-four hours, and one patient took *an ounce*. He preferred three or four grains of ipecacuanha in combination with the calomel, which rarely produced nausea after the first dose. To many of the patients he also gave opium freely, in combination with calomel. He also occasionally gave it uncombined; but opium alone is chiefly beneficial in another form of puerperal fever, which will be hereafter described. Where with the other symptoms there is distressing diarrhœa, we generally find the hydrargyrus cum cretâ combined with opium and ipecacuanha, more useful than calomel. It may be given in ten-grain doses, with from three to five of the Dover's powder.

Although in the acute form of puerperal fever the patient is to be kept upon the thinnest farinaceous food, in this form nourishment and even stimulants are early required. It may at first sight appear contradictory to prescribe leeches and mercury at the same moment with strong broths, jellies, and even wine and cordials; but experience proves the value of the practice. In the low condition of the nervous system, energy is wanted to produce healthy action, and without supporting the vital powers we find the patient sink much more readily under the influence of disease. This is a very important point in the treatment, and should always be kept in view. In the hospital we find the gin caudle, when prudently administered, a very valuable assistant in the treatment of the disease,

although as far as symptoms can prove it, inflammatory action exists, but then it is adynamic inflammation. Some of the distressing symptoms must be relieved by other remedies. Effervescing saline draughts, containing the bicarbonate of ammonia in camphor or mint julep, allay the sickness and eructations. Turpentine injections occasionally subdue the tension of the abdomen, but are inadmissible when there is troublesome diarrhœa. Injections of weak solutions of the chlorate of soda or lime, in warm gruel, into the vagina are useful, by correcting the fetid vaginal discharges should they exist. Dr. Collins has great confidence in the use of the warm bath; and though we have had no personal experience of it, we should be inclined to recommend it from his report. We have hitherto been deterred from the trial from the pain experienced on the least movement, and from the sensation of great exhaustion complained of; though when carefully managed, with ample and skillful assistance, this objection may be obviated; and it would be very likely to soothe the restlessness and promote free perspiration with an equal circulation.

There are often cases of a more protracted nature, which attain a certain approach to convalescence, but linger on for many days, and eventually sink. There are others where the whole disease appears to be chronic or subacute, and such cases are often met with, where there are no other suspicious symptoms than a look of anxiety, great sense of exhaustion, and a rapid pulse. We remember a patient who, on the eighth day of these symptoms, having had an accidental injury, exclaimed it was quite a relief to feel pain. These cases are insidiously dangerous, and it is a safe rule always to be on the watch when the pulse keeps up above 100 for any number of days after parturition. In the majority of these cases, tympanitis or effusion into the peritoneal cavity comes on at last, and they run the usual course, although no very prominent symptoms.have been previously noticed. In these, however, we find the same variety in the appearances on dissection that have been already noticed; in many the peritoneum alone shows signs of mischief; in others the uterus is principally affected; and again there are abscesses in the ovaries, the broad ligaments, and the Fallopian tubes. It is in the protracted cases, following more acute symptoms, that we have most frequently found the purulent deposits in the substance of the uterus, with or without the same occurrence in the joints or other parts of the body. In some of these instances there is no pain in the joints, or in the parts where the collection of pus takes place; but in many (as happened in the epidemic of 1822), there are phlegmonous appearances attended with acute pain. In those cases the calf of the leg and the elbow joint were uniformly affected, painful inflammation with hard tumefaction came on, and in a day or two an abscess formed. Many of these patients recovered, but the convalescence was exceedingly slow, and several times fresh abscesses formed at a time when all appeared satisfac-

tory. The remarkable destructive inflammation of the eye, which has been already mentioned, rare as it is, can hardly, perhaps, be placed as a symptom peculiar to this form of puerperal fever; but we have witnessed four instances of it, and in each there were purulent deposits in various parts of the body. In the five cases related by Dr. Marshall Hall, which also occurred after delivery, the same fact was noticed; there was the same rapid pulse with constitutional disturbance, lasting for many days before the inflammation of the eye was discovered. In Dr. Hall's cases the left eye was uniformly the one inflamed, and it is curious that such was the fact in the four which have come under our own knowledge. In only one of Dr. Hall's cases were any decided abdominal pain and tenderness noticed, whereas three out of the four of our cases had such symptoms. In none could any post-mortem inspection be obtained. Dr. Robert Lee (*Cyc. Prac. Med.*, art. Puerperal Fever) has alluded to two cases under his own care, where this destructive inflammation of the eye occurred in *both* eyes. He is inclined to believe, that this remarkable affection is the attendant upon the "morbid condition of the veins of the uterus," the purulent or other depraved secretions entering the system, and acting as a poison on the whole mass of blood. In Dr. Hall's cases and our own, no examination took place to elucidate this theory, and Dr. Lee does not quote any dissections to confirm it.

It may appear presumptuous to recommend any course of treatment in a disease which, as far as we know, has always been fatal; but in one case which we witnessed, so much marked benefit was obtained by stimulants, a generous diet, bark, ammonia, and large doses of opium, though the patient relapsed by an accidental alteration of the plan, that in a similar case we should certainly be inclined to follow it: such a course has also been the most successful in the instances of purulent deposits, without the affection of the eye.

In the chronic forms of the puerperal affection we have noticed, without these additional symptoms, a large blister over the abdomen, dressed with mercurial ointment, has been occasionally beneficial. Among the varieties of plans that have been tried, the topical application of ice to the abdomen may be mentioned; and with this some have recommended the internal administration of ice and iced drinks. We witnessed, many years ago, some sporadic cases treated in the former manner, and they recovered; but the symptoms were by no means severe, and within the last year it was adopted in some of the cases in the Lying-in Hospital, but not with any satisfactory results. The iced drink was very grateful, and taken with avidity; and though we could not trace any bad effects decidedly to the remedy, yet certainly no permanent advantage resulted. When in the epidemic already alluded to, the symptoms were accompanied with petechial blotches, a fatal adynamic, "spotted fever" was prevalent in many parts of the metropolis. In some

of the hospitals such cases were treated with marked benefit on *the saline plan*, recommended by Dr. Stevens in the West Indian fever and in cholera. On this account the saline medicines were given to many of our puerperal fever patients, whether petechiæ were present or not; but the result was by no means encouraging.

The *congestive* form of puerperal fever (so termed by Dr. Armstrong), is in our opinion merely a highly aggravated form of the first stage of the ordinary disease.* When reaction is established, if that can be brought about, the same train of symptoms follows, and the same course is run. A patient may die before reaction takes place, as they may die in the cold fit of an ague, or of some of the virulent tropical fevers; but we do not believe there is any peculiarity in the type of the disease, except in the intensity of this first stage. Hot baths, diffusible stimulants, hot frictions, stimulating injections, and perhaps emetics, form our chief resources to bring on reaction; and in some cases very cautious abstraction of blood may be employed, to relieve the right side of the heart, and promote a more free circulation. If the blood flows after the first few moments with freedom, and the pulse becomes more distinct, and the aspect of the patient improves, we may with confidence allow more blood to flow, but not enough to produce faintness. Where death has taken place in this congestive stage, as might be expected, the venous system is found gorged, and there are no traces of inflammatory action or effusion.

C. PUERPERAL INTESTINAL IRRITATION.

A far more common variety of puerperal fever, if it can be so called, and one of great consequence to discriminate, is that arising from intestinal irritation. It is not in itself inflammatory, and it does not *necessarily* lead to inflammatory action of any sort, but it is very apt to be mistaken, and to terminate fatally, and in a great measure from the bad adaptation of treatment. Besides this, it is a very frequent cause of the other varieties of puerperal fever, and intestinal irritation often accompanies, and seriously complicates, the more simple forms of those diseases. At any period after delivery, where the bowels have been previously neglected or mismanaged, this affection may come on.

I. SYMPTOMS.

The symptoms are more gradual in their progress at first: there is general uneasiness, scarcely describable by the patient, often for some days before the more marked symptoms make their appear-

* "I have seen a few who never grew warm after the rigor, which then resembled a convulsion." (Denman's *Midwifery*, 6th ed., p. 434.)

ance; the appetite fails; the tongue becomes coated with either a creamy, or a dirty white; the skin is over-cool for part of the twenty-four hours, and that state alternates with irregular febrile heat, accompanied often with headache, and generally a quick pulse; there is frequently deep-seated uneasiness in the abdomen, which is full and rather tense, often rather tender to pressure, but not generally to firm steady pressure; there is a frequent feeling of sickness, and often vomiting: sometimes this vomiting is profuse and incessant, and the fluid ejected is dark and offensive: in many instances this is thrown off the stomach with little or no effort, but apparently from the effect of flatulence. A very common symptom, more especially after the first day or two, is diarrhœa; the evacuations are dark, fetid, watery or slimy, with much flatulence, fetor of the breath, and increased abdominal tenderness; the pulse increases in rapidity; the exacerbations of fever are of longer duration, and attended with great prostration of strength and feeling of despondency; the tongue indicates subacute gastric inflammation—it is sometimes white in the centre with florid edges and tip, the bright red, angry-looking portion suddenly emerging from the border of the white coat; at other times the white or yellow coat entirely disappears, and the whole tongue is left morbidly red, shining, and glossy; in some cases perfectly glazed; in others it is rough, and as it were scalded, the mucous membrane of the mouth being at the same time often covered with aphthæ. The strength of the patient rapidly diminishes under the exhausting diarrhœa and the continual or irregular fever, and death is generally preceded by some of the symptoms of the other forms of puerperal fever. Many of these cases are treated by bleeding, on the supposition that they are inflammatory, but bleeding only aggravates the symptoms. They are also more likely to arise after labours which have been unusually protracted, or where uterine hemorrhage has occurred to a great extent. In the latter instances, besides the symptoms described, there is much affection of the head; acute pain, with strong pulsation in the centre, confused noises, want of sleep, low delirium, and constant restlessness. In spite of the palpable cause of these distressing sensations, it is by no means uncommon to find this form of child-bed fever mistaken for vascular plethora, and the temporary relief to the head, obtained by the local abstraction of blood, has often led to a repetition of exhausting remedies.

II. ANATOMICAL CHARACTERS.

In several instances which have fallen under our notice, where death took place, the most striking circumstance on post-mortem examination, was the entire absence of organic changes. There was generally a large quantity of air in the instestines and stomach, a pale and bloodless state of all the tissues and organs, venous con-

gestion in the vessels of the brain, but no lesion sufficient to account for death. In some of the more protracted forms accompanied with diarrhœa, the mucous membrane of the large intestines is now and then found ulcerated in patches; and in other portions of the canal it has assumed a peculiarly smooth appearance in the interspaces of the mucous follicles. Where the condition of intestinal irritation has been accompanied or followed by other symptoms denoting more serious disorder, the appearances on dissection are found similar to those which have been previously described.

III. DIAGNOSIS.

It is most important to detect this form of mischief early, and to distinguish it from the more formidable conditions of the puerperal state. They are, however, so often blended or complicated, as to increase materially the difficulty. When uncomplicated, the chief points to be noticed are, the insidious character and slow progress of the symptoms, the state of the tongue, and the condition of the secretions. The absence of acute pain and tenderness is not to be much depended upon, as it has been already observed that those symptoms are not always present in the peritoneal fevers. The irritable state of the tongue, the peculiarly foul and offensive evacuations, and the subsequent diarrhœa, when existing along with the signs of inflammatory mischief in the abdominal or pelvic cavity, whether of the sthenic or malignant character, are all to be taken as evidences of the complication of this state of intestinal irritation with the genuine puerperal fever.

IV. TREATMENT.

In describing the treatment, we shall limit our observations to the simple state of intestinal irritation; the modification of such treatment, when applied to the complicated varieties, must depend entirely on the nature and peculiarities of the accompanying disease. The obvious indications are, to remove the offensive matter from the bowels, to alter and improve the depraved secretions, and to sustain power without increasing febrile action. When we are called to such a case early, a full dose of calomel, James's powder, and opium, may be given, followed in four or five hours by castor oil, which is generally the most efficient and the least irritating purgative. If there be much sickness, so that such remedies will not be retained, from five to ten grains of calomel alone will almost always allay the vomiting; after which, a large enema of gruel and castor oil may be injected. Several successive doses of purgatives will generally be required to remove the scybala and offensive accumulations from the intestines, and a change of purgative will fre-

quently accomplish this, when the first has latterly brought away nothing but watery motions. The repetition of the purgatives must depend on the strength of the patient and on the effect produced, the full state of the abdomen, when felt by the hand, being our guide as to the existence still of an unremoved load. When diarrhœa is an early symptom, or at least has begun before we see the patient, we shall do but little good in our efforts to restrain it, unless we give these active purgatives. Chalk mixtures and astringents only aggravate the symptoms in the first instance, the cause which keeps up irritation still remaining. After we have succeeded in cleansing the bowels, milder alteratives will be sufficient. The hydrargyrum cum cretâ, or small doses of calomel combined with ipecacuanha and prepared chalk, may be given at short intervals, interposing some mild laxative, as rhubarb and magnesia, or castor oil, once in one or two days. Where the patient has been much exhausted, an enema of gruel may be given; and if there is much soreness of the lining membrane, laudanum or tincture of henbane may be added. Opium may be combined with the alteratives, especially where the diarrhœa still continues profuse. We have often found advantage in this state, from occasional very small doses (eight to ten grains) of sulphate of magnesia in some spiced water, combined with five or six drops of laudanum. Sometimes the nitric or sulphuric acid with laudanum effectually restrains the diarrhœa, and improves the character of the tongue, especially if there are aphthous ulcerations. The usual astringent remedies are inadmissible in the commencement, and only to be employed if the diarrhœa persist after the bowels have been cleared. The diet should be nourishing, but not stimulating, unless there is very great exhaustion. Arrow-root, gruel, broth, jelly, and other bland articles, are the safest. Milk, with soda or Seltzer water, is very grateful to the patient in allaying thirst and keeping up power, especially where there is sickness. As the diarrhœa subsides, and the secretions become healthy, more nourishment may be taken; but any hurry in this respect, and any carelessness in the nature of the diet, often lead to relapses. Infusions of cascarilla or cinchona, with either ammonia or the mineral acids, may be tried in the convalescent stage, and pure air will be then of great advantage. In cases where the head affection follows exhausting labours, with or without other signs of intestinal irritation, still greater caution is necessary in the treatment. In both, from a disposition to be too acutely alive to all ailments after parturition, there is often an eagerness to use active remedies, and especially to bleed. Such an error is peculiarly dangerous, and yet it is by no means uncommon in the class of cases we are now describing. A foul state of bowels aggravates the head affection, and however weak the patient may be, the judicious and cautious use of purgatives becomes absolutely necessary. The very distressing sensations about the head are best relieved by opium and camphor in full doses, and the alternation of these

remedies with the purgatives is the principal point in the treatment. Cold applications to the head, and fomentations to the extremities, give much comfort to the patient, and produce repose. Nourishment is here of great importance; it should be of the lightest description, and frequently given in small quantities; as, though there is an exceedingly rapid digestion, from the natural effort to supply the loss which has been sustained, the power of the stomach has been much reduced, and the food should be that which will be most easily assimilated.

D. FALSE PERITONITIS.

There is a mild form of puerperal fever, first described by the late Dr. Gooch, the existence of which has been denied by some authors, but which has been prevalent at various times, and of which we have seen a great many instances. Mr. Hingeston has published several cases of it in the first volume of the *Medical Gazette*, and, more recently, Dr. Ferguson has given its history in his valuable work on puerperal fever. It seems to be the first stage of the more active inflammatory form, but, as if it stopped there, yielding to treatment which would have no great effect over acute inflammation, and aggravated by active depletion, its morbid anatomy is not to be detected. In those cases which have died, death has either followed a more advanced stage of the disease, when inflammatory mischief has ensued upon the previous symptoms, or it has followed the use of too violent remedies, when no traces of disease sufficient to account for death could be detected on dissection. In many of these cases slight deposits of serum tinged with blood are often found in the serous cavities of the body, the result not of inflammatory action, as there is a pale and bleached state of membrane, but the consequence of over bleeding, which produces what Magendie calls a defibrinized state of the blood, when, its cohesive qualities being lost, it infiltrates through the tissues. This disease has been called "abdominal pain," which is its chief characteristic; but such pains are so various, that such a name is by no means satisfactory. False peritonitis, a name by which it has been long known in our lying-in hospital, is open to objections; but it is short, and will be less likely to mislead. The influence of the nervous system as well as the vascular in producing inflammation is acknowledged, and it would seem that in these cases the symptoms may be traced to that early condition in which the nerves of the peritoneum are chiefly affected, a certain degree of constitutional disturbance is produced, the balance is disturbed, but the vascular system has not yet been sufficiently excited to produce actual inflammation. In most of the epidemics of puerperal fever, this form has existed with the more formidable varieties, but it has now and then occurred to a very

considerable extent, when the other forms of puerperal fever have been rare exceptions.

I. SYMPTOMS.

It is characterized by pain and tenderness of the abdomen, a slightly coated tongue, and a rapid, soft, compressible pulse; and though a rigor often precedes the attack, the skin is very little increased in temperature. Dr. Gooch remarks that such symptoms are most apt to occur when the patient, in her ordinary health, is delicate and nervous, or when there has been any irritating cause, such as severe gripings from purgatives, or unusually severe after pains from collection of coagula. An experienced practitioner will generally distinguish this mild form of puerperal fever by the softness of the pulse, and by the absence of that peculiar anxiety of countenance which marks the more severe forms; but if he were to be guided alone by the usual definitions of puerperal fever, viz., pain of the abdomen with tenderness and a rapid pulse, he would fall into serious error. The effect of remedies in these cases is most important, as diagnostic of their real character: bleeding produces little relief; if carried beyond a few ounces it accelerates, and (we believe) may cause the patient's death; the blood shows no marks of inflammation, and the peritoneum or any of the pelvic or abdominal viscera show no signs of disease. Fomentations, poultices, diaphoretics, and opiates, soon remove the symptoms, and in general this is all that is necessary to be done, in addition to the exhibition of an occasional mild purgative. If in a doubtful case such remedies are tried, and yet the symptoms increase and become more formidable, we may be satisfied that the more active form of disease really exists, and we shall not find that the remedies from which we had hoped for relief will have done harm, or at all interfered with the efficiency of subsequent treatment. Sometimes such a mixed character of symptoms appears, that mild antiphlogistic treatment may be combined with the sedative and diaphoretic; in such cases hydrargyrus c. cretâ, or calomel, may be added to the opium, and James's powder, or Dover's powder; and a few leeches may be also beneficially applied to the seat of the pain.

The effect of nervous irritation and of mental emotion on the frame of a woman after delivery, often produces a collection of alarming symptoms, which have been classed as a distinct form of puerperal fever (the *ataxic*), by Tonnelle and Dr. Ferguson. We are obliged to confess, however, a great difficulty in such a distinction. The irritability of frame which leads to the anomalous symptoms described by these authors, is merely an accidental circumstance. The chief characteristics are, sudden and alarming sinking, almost a total want of sleep, great restlessness, often accompanied with delirium; a most anxious state of mind, with fear

of impending death; and a pulse which is strikingly rapid, weak and irregular. Though there is sometimes no particular pain, there is generally acute pain in some part, principally in the abdomen, the hypogastrium, or the head. Upon a more careful investigation, however, we find that the pulse becomes more steady and tranquil under the influence of cheering looks and words of comfort, or by the attention of the patient being diverted from her malady. The locality of the pain also varies, and if there be tenderness, it is not always localized, the integuments of other parts of the body being very frequently equally sensitive. If we accidentally find the patient asleep, the pulse is scarcely beyond its natural quickness, and the respiration, previously hurried, is observed to be more regular and normal. If these cases are mistaken, and evacuations of blood and depleting remedies employed, the patient will suddenly sink, and on examination of the body, no lesions sufficient to account for death are to be detected. The most effectual treatment consists in giving stimulants, if there be much exhaustion; nourishment at frequent intervals, and opium. In combination with camphor this remedy seems still more efficacious, and both should be given in large doses. From five to ten grains of camphor with one grain of either of the salts of morphia, will often in a few hours subdue every symptom of apparently formidable disease.

The state of body in which such symptoms are apt to occur, is closely allied to, if not identical with, the hysterical condition; which in women, under ordinary circumstances, so often produces, modifies and magnifies symptoms closely resembling serious organic diseases. By any one who is not conversant with the infinite variety of these nervous or hysterical affections, there is great risk of mistakes being made; and after childbirth, especially, symptoms often arise which simulate very remarkably real inflammation of almost every organ, but especially of the brain and the pelvic or abdominal viscera. The diagnostic signs are clearly laid down by Dr. Ferguson in his account of the *ataxic* form of puerperal fever; and the appropriate treatment, as well as the danger of mistaking the disease, forcibly insisted upon; but we must decidedly consider it a fallacy to call this affection puerperal fever at all. Exactly as in hysteria, under ordinary circumstances, we find the sudden migration of the symptoms from the organ apparently affected, the great anxiety and alarm of the patient, the anomalous character of the attacks, and, above all, the beneficial effects of sedative remedies, and of the proper administration of nourishment and stimulants. Such cases are by no means uncommon; they occur among the lower classes, most frequently in gin-drinkers and women of enfeebled constitutions, as well as in the nervous, excitable, and delicate of the higher ranks. They appear to us much more allied to puerperal mania than to puerperal fever, but they most nearly resemble hysteria. It must not be forgotten, however, that in such an excitable state of the nervous system, real puerperal fever may

arise; but though it will be additionally difficult to recognize and to treat this combination, attention to the condition of the constitution we have to deal with will materially assist us in meeting the evil. It may be well to observe here, that while practitioners are often misled by the patient's alarm, which invariably aggravates the symptoms, they are not unfrequently led into error by their own fears. It has fallen to our lot on several occasions to witness this, and we have known serious injury resulting from being too precipitate in treating disease which only existed in the mind of the medical attendant. Rigors often take place merely when the milk begins to flow; tenderness of the hypogastrium, to some extent, will be found in most women, upon making any sudden or rough pressure for the first few days after delivery. Such symptoms are often inquired for by the practitioner, when his mind has been recently distressed by the loss of a patient after childbirth; and being easily found, the judgment is unsettled, and disease is actually created by the treatment intended to avert it. It is very probable that many supposed cases of contagion might be explained in this manner.

The existence of *erysipelas* in hospitals, or among the infants where the mothers have puerperal fever, has been long noticed. Many such coincidences have happened in the General Lying-in Hospital, and servants and nurses even have been often attacked. This has led some to consider the inflammation which occurs in puerperal peritonitis, &c., to be of an erysipelatous character. In those instances in which the morbid appearances consist chiefly of a copious serous effusion, this may perhaps be the case; but we can hardly assent to this doctrine where firm lymph is deposited. The great resemblance between the effect of parturition on the cavity of the uterus, and what takes place after some important surgical operations, amputation for instance, as pointed out by Cruveilhier, would lead one to expect that erysipelas, so common in the latter instances, would not be rare in the former.

E. MILK FEVER.

If under the head of puerperal fevers we are to include all the fevers to which lying-in women are liable, and that are peculiar to the puerperal state, we must not pass over what is commonly called *milk fever*. It is so entirely distinct, however, from those fevers which have been already described, that the consideration of it must be equally distinct.

I. SYMPTOMS.

In all women, about the third day after delivery, there is a degree of arterial and nervous disturbance resulting from the important process which is established at that period for the nourishment of the child. When the breasts begin to be distended with the lacteal secretion, there is often a slight shivering; the head feels oppressed or painful, the vision is confused, the sleep disturbed, the mind occasionally wanders, and there are thirst, a slight increase of the pulse and of the temperature of the skin; but in a few hours these symptoms gradually subside, and in numerous instances the disturbance is so slight, that it hardly attracts attention. But in other cases these symptoms are aggravated to an extent which often threatens the patient's life, and demands from the practitioner the most anxious attention. In these severe cases there is a well-marked precursory rigor, followed by great pain and throbbing of the head, with much intolerance of light and sound; the countenance is highly flushed; there are a contracted pupil and injected state of the conjunctiva; the pulse is rapid, full, and hard; the skin intensely hot and dry; the thirst excessive; and the tongue dry and coated. If such symptoms are not speedily alleviated, the milk is no longer secreted, the breasts become flaccid, the head symptoms become more severe, there is violent delirium, and meningitis is evidently established. It is a common expression in such cases, that "the milk flies to the head." It certainly happens in many, that on venesection the serum of the blood is found of a remarkably milky appearance; it is white and opaque, but without any creamy surface. These severe attacks may be generally traced to a too stimulating diet, a heated atmosphere, much exertion and disturbance in attempts to suckle, and still more frequently to mental agitation. They are much less frequent in modern times than formerly, when hot fires, crowded blankets, and brandy caudle, were the usual appendages to the lying-in chamber.

II. TREATMENT.

The remedies in the slighter forms of this disease may be limited, in general, to the free administration of saline draughts and diaphoretics, with purgatives which contain the neutral salts; the milk should be gently drawn off, and the breasts fomented or poulticed; the room should be kept cool and well-ventilated; the most perfect quiet should be observed; the mind should be soothed, and agitation or exertion carefully avoided; the diet should be strictly antiphlogistic, and warm diluents plentifully supplied. A remission of the symptoms will then speedily take place, accompanied by a copious

perspiration and tranquillity of pulse. In the more severe cases, when inflammation of the membrane of the brain is threatened or actually exists, the free use of the lancet is chiefly to be depended upon. Blood must be taken largely and in a full stream, to be repeated at intervals, according to the necessity of the case and the powers of the patient; but in these attacks the loss of blood is generally borne well. Active purgatives, enemata, calomel in full and frequent doses, antimony, digitalis, and those remedies which depress the circulating power, will be valuable auxiliaries in subduing the violence of the symptoms. Fomentations should be applied to the breasts, and the child occasionally applied, as a means of re-exciting the secretion of milk. Cold evaporating lotions or ice may be kept constantly on the head, the hair being removed, and where the pain is very severe, and not readily relieved by the loss of blood from the arm, leeches or cupping-glasses may be applied to the head, or the temporal artery may be opened. In these cases many practitioners recommend blisters to the scalp, but our experience of them in that situation is not at all favourable, though we have often found benefit from their application to the legs, or to the nape of the neck. Applied to the scalp they have often seemed to increase the delirium and restlessness, and have not acted so favourably as the direct application of cold, the soothing effects of which have frequently been strikingly salutary. One of the earliest signs of recovery is the re-appearance of the milk in the breasts, and upon that taking place, the other symptoms usually improve with great rapidity. When, however, the progress of the disease is less favourable, and the remedies fail, symptoms of effusion either suddenly or gradually come on, and coma with dilated pupils, often terminating in convulsions, supervenes. On dissection, the usual results of acute inflammation of the brain are discovered.

There are symptoms somewhat resembling those previously described, and arising from the same cause, lactification, which are also very common, but which are not inflammatory; they are merely nervous, and not uncommonly end in one of the forms of puerperal mania. There are the same restlessness and want of sleep, wandering of mind, and rapidity of pulse; but the skin is cooler than natural, and the pulse weak and irregular. There is readiness to start at the least noise, and an alarmed and anxious look, but sounds are not painful, and there is no dislike to the light. There may be headache, and confusion of ideas, but relief is readily obtained by keeping the head low and by soothing the mind. The milk retires, but it is gradually or irregularly returning at intervals. Such symptoms usually follow anxiety or agitation of mind, undue fatigue in attempts to suckle, over-excitement of any description, or exhaustion from hemorrhage or from diarrhœa. In these cases opium and other narcotics in full doses, with camphor, will speedily calm the

distressing sensations, and recovery will be promoted and secured by care being taken to keep the patient perfectly quiet, and to remove every cause of excitement and fatigue. If the convalescence be interrupted by the sucking of the infant, it should be at once discontinued.

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